

NEW AND UNUSUAL MOLLUSKS COLLECTED BY R/V
JOHN ELLIOTT PILLSBURY AND R/V GERDA IN
THE TROPICAL WESTERN ATLANTIC¹

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ABSTRACT

Fifty-nine species of new or rare marine mollusks from the Caribbean area, 55 gastropods and four pelecypods, are reported and illustrated. Among these, the following new taxa are described: *Calliostoma olssoni*, n. sp., *Thelyssa callisto*, n. gen., n. sp., *Lischkeia deichmannae*, n. sp. (Trochidae); *Sconsia nephele*, n. sp. (Cassididae); *Typhis* (*Siphonochelus*) *tityrus*, n. sp. (Muricidae); *Columbarium* (*Peristarium*) *electra*, n. subgen., n. sp., *C. (P.) merope*, n. sp., *C. (P.) aurora*, n. sp. (Columbariidae); *Coralliophila fax*, n. sp., *C. sentix*, n. sp. (Coralliophilidae); *Teramachia chaunax*, n. sp. (Turbinellidae); *Lyria* (*Cordilyria*) *cordis*, n. subgen., n. sp., *Scaphella* (*Clenchina*) *evelina*, n. sp., *Volutomitra persephone*, n. sp., *V. erebus*, n. sp. (Volutidae); *Dimya tigrina*, n. sp., *Basiliomya goreau*, n. gen., n. sp. (Dimyidae). The first record of living specimens of *Bathygalea coronadoi* (Crosse) is reported. *Mesorhytis meekiana* Dall, originally assigned to the family Fasciolaridae, is transferred to the genus *Teramachia* and placed in the family Turbinellidae. Shells are illustrated by photographs; radulae and opercula of some of the species are illustrated by drawings; and the gross anatomy of the mantle cavity is illustrated for *Oocorys sulcata* Fischer, *Vasum capitellum* (Linné), and *Lyria cordis*, n. sp.

INTRODUCTION

The faunal survey of the tropical West Atlantic, commenced in 1962 aboard R/V GERDA and in 1964 aboard R/V JOHN ELLIOTT PILLSBURY, has amassed an enormous amount of information concerning the distribution of invertebrates in this region. Because of the systematic diversity of the collections obtained, detailed studies of the entire fauna will be completed only over a long period of time. Many of the records, however, are of sufficient importance to warrant investigation in advance of full faunistic treatment. Some of these have revealed systematic problems of such magnitude that they cannot be dealt with adequately out of scientific

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context. Others have proved to be sufficiently clear-cut to permit treatment in preliminary fashion. Thus, it is the purpose of this paper to report new distributional records of certain rare or poorly known species and to describe some of the more important novelties that have come to light during processing of the collections.

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It is a pleasure to extend a special word of appreciation to Axel A. Olsson, whose knowledge of the molluscan fauna of Middle America and its geological background has been an invaluable source of information, and whose association throughout this study has been a constant source of encouragement. Mrs. Jo Anne H. Romfh, Talbot Murray, and Dennis Opresko have rendered assistance in ways too numerous to mention. Mr. Robert C. Work has never failed to share his considerable knowledge of tropical American mollusks. Mrs. Constance Stolen McSweeney executed the drawings of opercula reproduced in Figures 10, 17, 22, 56, and 61.

Specimens collected by R/V OREGON along the coast of South America were obtained during EQUALANT cruises in which Donald R. Moore and Robert C. Work, of the School of Marine and Atmospheric Sciences, were members of the scientific party.

SYSTEMATIC PART

The classification employed herein is basically that of Thiele (1929-35), incorporating modifications used by Keen (1958) and other current authors. It is by no means to be taken as authoritative, as classification of the higher taxa is not the aim of this paper. In general, however, I am unable to subscribe to the currently fashionable practice of generic splitting, as this commonly has been based upon insufficient biological grounds and thus serves no useful purpose.

The systematic disposition of the species included is as follows:

Class GASTROPODA

Family Trochidae

1. *Calliostoma* (*Kombologion*) *rosewateri* Clench & Turner
2. *Calliostoma* (*Kombologion*) *schröderi* Clench & Aguayo
3. *Calliostoma* (*s.l.*) *olssoni*, new species
4. *Calliostoma* (*Kombologion*) *hendersoni* Dall
5. *Lischkeia deichmannae*, new species
6. *Basilissa alta* Watson
7. *Thelyssa callisto*, new genus, new species
8. *Fluxina discula* Dall

Family Turbinidae

9. *Turbo* (*Halopsephus*) *haraldi* Robertson

Family Epitoniidae

10. *Epitonium* (*Amaea*) *mittelli* (Dall)
11. *Epitonium* (*Solutiscala*) *vermetiforme* (Watson)

Family Cypraeidae

12. *Cypraea* (*Propustularia*) *surinamensis* Perry

Family Cassididae

13. *Bathygalea coronadoi* (Crosse)
14. *Sconsia striata* (Lamarck)
15. *Sconsia nephele*, new species
16. *Morum* (*Cancellomorum*) *dennisoni* (Reeve)

Family Oocorythidae

17. *Oocorys sulcata* Fischer

18. *Dalium solidum* Dall

Family Ficidae

19. *Ficus howelli* Clench & Aguayo

Family Muricidae

20. *Murex* (*Murex*) *olssoni* Vokes
21. *Murex* (*Murex*) *donmoorei* Bullis
22. *Murex* (*Murex*) *cabritii* Bernardi
23. *Murex* (*Siratus*) *beauui* Fischer & Bernardi
24. *Murex* (*Chicoreus*) *brevifrons* Lamarck
25. *Murex* (*Paziella*) *actinophorus* Dall
26. *Typhis* (*Siphonochelus*) *longicornis* Dall
27. *Typhis* (*Siphonochelus*) *bullisi* (Gertman)
28. *Typhis* (*Siphonochelus*) *tityrus*, new species
29. *Typhis* (*Talityphis*) *expansus* Sowerby
30. *Typhis* (*Pterotyphis*) *pinnatus* Broderip

Family Columbariidae

31. *Columbarium* (*Histricosceptrum*) *bartletti* Clench & Aguayo
32. *Columbarium* (*Fulgurofusus*) *bermudezi* Clench & Aguayo
33. *Columbarium* (*Fulgurofusus*) *brayi* Clench
34. *Columbarium* (*Peristarium*) *electra*, new subgenus, new species
35. *Columbarium* (*Peristarium*) *merope*, new species
36. *Columbarium* (*Peristarium*) *aurora*, new species

Family Coralliophilidae

37. *Coralliophila dalli* (Emerson & D'Attilio)
38. *Coralliophila mansfieldi* (McGinty)
39. *Coralliophila tectumsinensis* (Deshayes)
40. *Coralliophila sentix*, new species

41. *Coralliophila fax*, new species
42. *Coralliophila lamellosa* (Philippi)
43. *Coralliophila lactuca* Dall
Family Buccinidae
44. *Phos beauui* Fischer & Bernardi
Family Turbinellidae
45. *Teramachia meekiana* (Dall)
46. *Teramachia chaunax*, new species
47. *Turbinella laevigata* Anton
48. *Vasum capitellum* (Linnaeus)
Family Volutidae
49. *Voluta virescens* Lightfoot
50. *Lyria* (*Cordilyria*) *cordis*, new subgenus, new species
51. *Scaphella* (*Scaphella*) *junonia* (Lamarck)
52. *Scaphella* (*Aurinia*) *dubia* (Broderip)
53. *Scaphella* (*Clenchina*) *evelina*, new species
54. *Volutomitra persephone*, new species
55. *Volutomitra erebus*, new species

Class PELECYPODA

- Family Dimyidae
56. *Dimya argentea* Dall
 57. *Dimya tigrina*, new species
 58. *Basiliomya goreauui*, new genus, new species
Family Spondylidae
 59. *Spondylus gussoni* O. G. Costa

ZOOGEOGRAPHIC REMARKS

Previous work on the molluscan collections assembled in the course of faunal investigations at the Institute of Marine and Atmospheric Sciences has shown that the family Pleurotomariidae, long thought to be most extensively represented in the western Pacific from Japan southward and westward, is even better represented in the western Atlantic (Bayer, 1963, 1965, 1967). The recent discovery of a new species from Brazil (Moreira Leme & Penna, 1969) brings the total for this region to eight species, whereas six are known from Japanese and adjacent waters.

Another archaeogastropod genus associated chiefly with the Japanese fauna is *Lischkeia*, a new species of which has recently been trawled in the Antilles by R/V PILLSBURY. Among the turbinids, *Turbo haraldi* is remarkably similar to some well-known Indo-Pacific species.

Although species of the genus *Columbarium* are known from various parts of the world, *Columbarium pagoda* from Japan is perhaps the best known of all, so that reference to the genus immediately directs attention to the Japanese fauna. Four species with carinate shells have been taken in the western Atlantic by the BLAKE and the OREGON, and operations by the GERDA have now brought to light three species characterized by non-carinate shells. Thus, at least seven species of this genus occur in the

Caribbean region, eight if we accept the possibility that *C. sarissophorum* (Watson), originally from Pernambuco, also may occur there.

The genera *Coralliophila* and *Latiaxis* are also especially well represented in the Japanese fauna even though they are not by any means restricted to it. Nevertheless, the well-known *Coralliophila dalli* (Emerson & D'Attilio) is so similar to the Japanese *C. deburghiae* that even so experienced a zoologist as Dall misidentified it as that species. The discovery of two new species reported herein, also similar in many respects to Indo-Pacific species, serves to strengthen further the relationship of our fauna with that of the Pacific. It is to be expected that further exploration of the precipitous Antillean slopes abounding in corals will reveal additional species. Here, however, we are dealing with a group having a worldwide tropical distribution, and some western Atlantic species are closely related to, or identical with, eastern Atlantic and Mediterranean forms.

The presence of *Howellia*, now referred to the Indo-West Pacific genus *Teramachia*, in the Caribbean Sea has been known for thirty years (Clench & Aguayo, 1941), and its type-species, *H. mirabilis*, bears a strong resemblance to the Japanese *Teramachia tibiaeformis* Kuroda, the type-species of *Teramachia*, and to other large-shelled species from the Philippine Islands (*dalli*, *johnsoni*, *smithi*; see Weaver & du Pont, 1970). Specimens of *Mesorhytis meekiana* Dall and a related species taken by R/V PILLSBURY in the Caribbean show very close similarity of shell characters to the Philippine *Teramachia barthelowi* (Bartsch), and they accordingly are assigned to that genus. Their radular and opercular characters, now observed for the first time, indicate turbinellid rather than volutid affinities, but whether or not these small-shelled species of *Teramachia* will prove to be congeneric with the larger ones must remain for the future to reveal. Nevertheless, both groups are represented in both the Caribbean Sea and Indo-West Pacific waters.

Two new species of the genus *Volutomitra*, taken in rather deep water in the Caribbean Sea by R/V PILLSBURY, have their closest relationship with species from the Bering Sea and call to mind the distribution of the pelecypod *Thyasira disjuncta*, which occurs from Sitka, Alaska, to Coos Bay, Oregon, but found also by the PILLSBURY in the southwestern Caribbean (Boss, 1967).

Class GASTROPODA

Family Trochidae

1. *Calliostoma* (*Kombologion*) *rosewateri* Clench & Turner, 1960 Figs. 1, 2

Calliostoma (*Kombologion*) *rosewateri* Clench & Turner, 1960, *Johnsonia*, 4 (40): 41, pl. 6, fig. 3 (radula); pl. 10, fig. 2 (jaws); pl. 26 (shells).

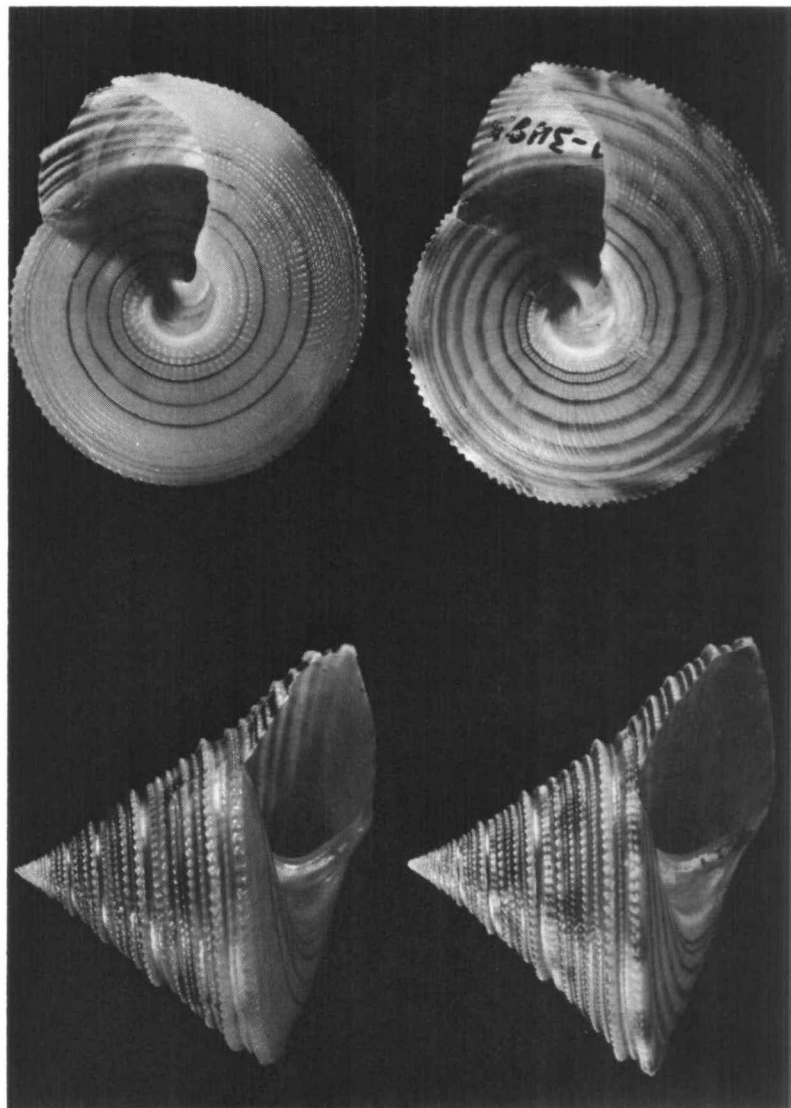


FIGURE 1. Trochidae. *Calliostoma rosewateri* Clench & Turner: upper, from Sta. P-877, height 29 mm, diam. 32.5 mm; lower, from Sta. P-394, height 29.5 mm, diam. 34.4 mm.

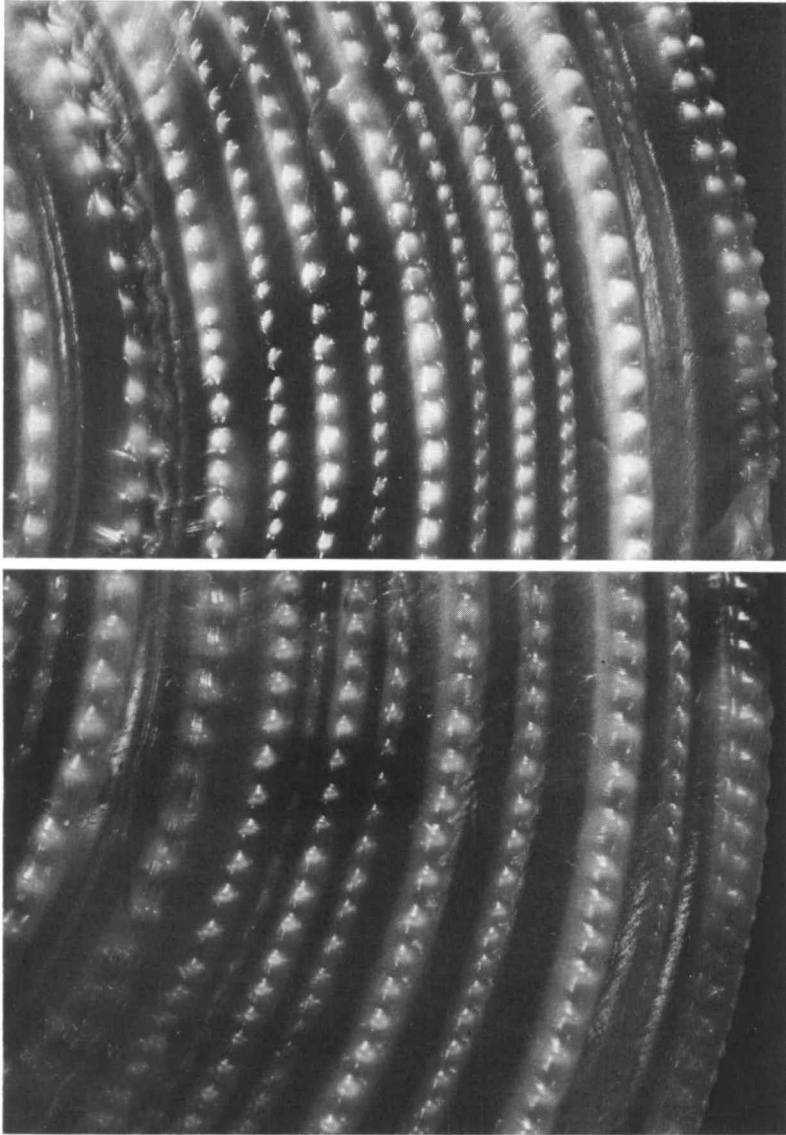


FIGURE 2. Trochidae. *Calliostoma rosewateri* Clench & Turner; sculptural detail: left, from Sta. P-877; right, from Sta. P-394.

Material Examined.—PILLSBURY Sta. P-394. Caribbean Sea west of Cartagena, Colombia: 9°28.6'N, 76°26.3'W, 421-641 meters, 16 July 1966. One specimen, height 29.5 mm, greatest diameter 34.4 mm.—PILLSBURY Sta. P-877. Lesser Antilles, ESE of Bequia Island: 13°16.7'N, 61°05.6'W, 329-467 meters, 6 July 1969. One specimen, height 29 mm, maximal diameter 32.5 mm.

Remarks.—Two living specimens about the same size as the type-material were obtained by R/V PILLSBURY. One of these, from off Cartagena, resembles the type in all respects (Figs. 1 [lower], 2 [right]). The other, from the Lesser Antilles, differs slightly as to details. The two beaded cords separating the three strong ones above the periphery are absent and the distinct subsutural plain cord is poorly developed (Fig. 2 [left]). The color pattern on the spire is identical in the two specimens, but that from the Lesser Antilles has only four, very distinct, reddish brown spiral lines on the base (Fig. 1 [upper]) compared with 5 or 6 in the types and 7 in the example from station P-394, in which those toward the periphery are broader and more diffuse (Fig. 1 [lower]).

These two records extend the geographical range of the species to the westward and to the northward, and demonstrate somewhat more variation than was indicated by the type-material.

2. *Calliostoma (Kombologion) schroederi* Clench & Aguayo, 1938

Fig. 3

Calliostoma schroederi Clench & Aguayo, 1938, Mem. Soc. Cubana Hist. nat., 12: 377, pl. 28, fig. 3.—Clench & Turner, 1960, Johnsonia, 4(40): 45, pl. 7, fig. 2 (radula); pl. 11, fig. 1 (jaws); pl. 29 (shells).

Material Examined.—GERDA Sta. 915. Bahama Islands, Northwest Providence Channel: 25°54'N, 78°12'W, 439 meters, 26 September 1967. One specimen, height 20 mm, greatest diameter 24 mm.

Remarks.—Except for a specimen taken by R/V COMBAT (Sta. 235) off Matanilla Shoal, Little Bahama Bank, this species is known from the Old Bahama Channel off the north coast of Cuba. The present record from the Bahamas suggests that the species is probably generally distributed through this area on the proper substrate between roughly 250 and 450 meters.

3. *Calliostoma (s.l.) olssoni*, n. sp.

Fig. 4, (left)

Description.—Shell trochoid, solid, umbilicate, rather strongly sculptured. Whorls eight, flat sided, distinctly keeled. Spire moderately extended, weakly concave, produced at an angle of 84°. Nuclear whorls about 1½, worn but apparently developing cancellate sculpture quite early. Base moderately

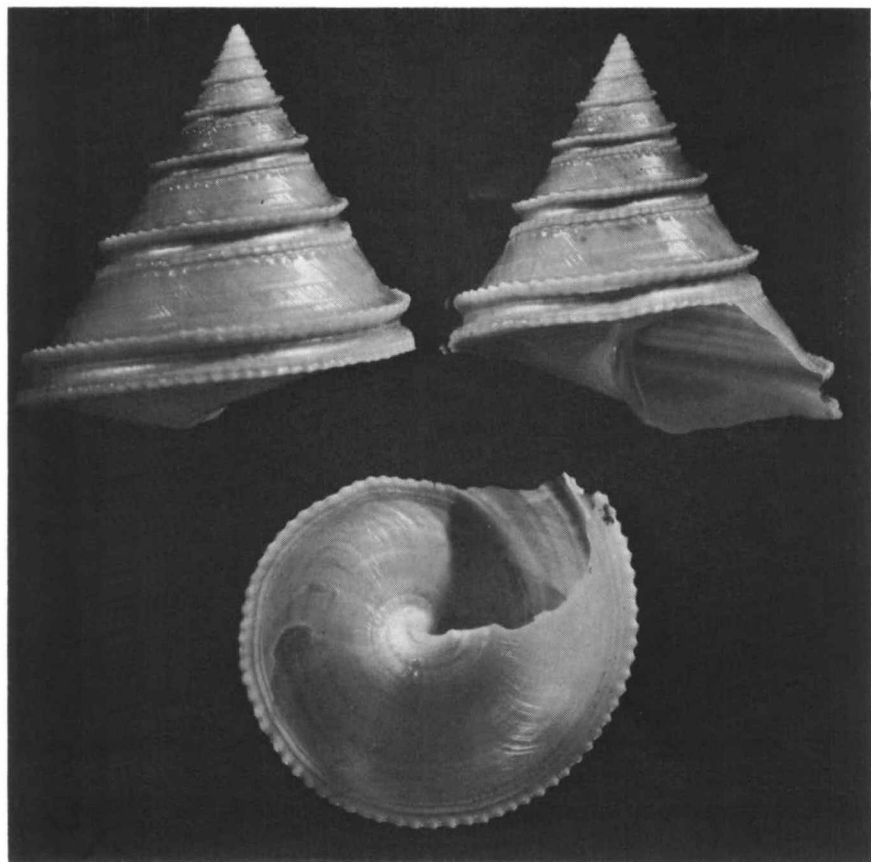


FIGURE 3. Trochidae. *Calliostoma schroederi* Clench & Aguayo, Sta. G-915, height 20 mm, diam. 24 mm.

convex. Aperture subquadrate, outer lip evidently simple (broken in the unique type). Columella weakly arched, anterior truncated. Body whorl with ten beaded spiral cords above the periphery, all but the lowest one white, the interspaces orange-brown; cord adjacent to periphery narrower, indistinctly beaded, colored like the area to either side. Peripheral cord strong but not beaded, canted somewhat apically; rounded basal part of peripheral keel with four or five indistinct raised spiral lines, remainder of base smooth and polished, marked with microscopic radial lines of growth. Spire with pinkish brown axial blotches that somewhat discolor the white spiral cords; periphery with a series of purplish pink blotches which extend inward on the base toward the umbilicus as curved or angular

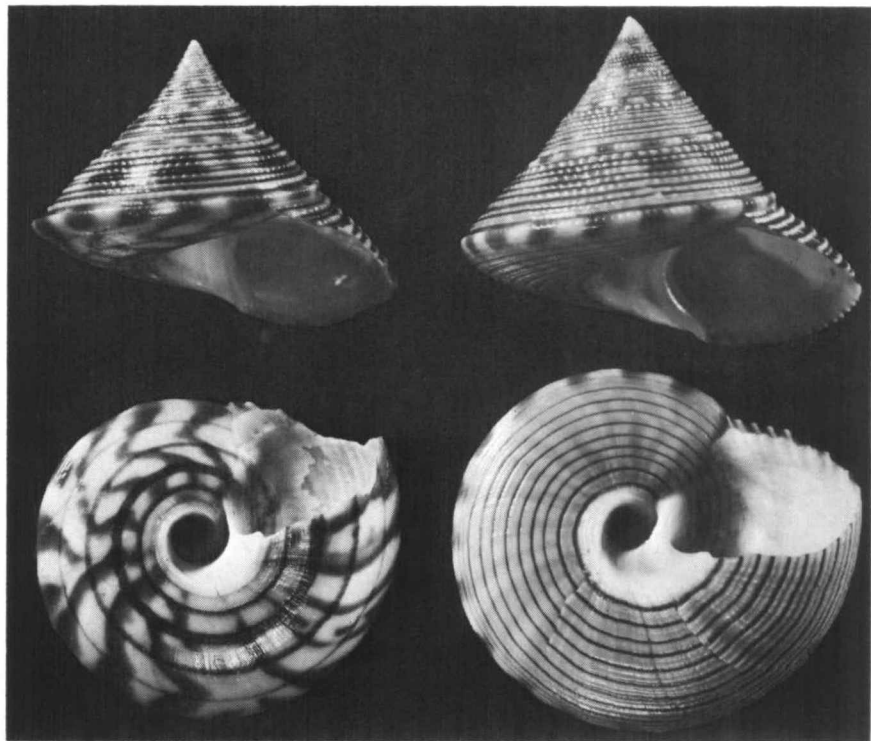


FIGURE 4. Trochidae. Left, *Calliostoma olssoni*, n. sp., holotype, Sta. P-876, height 16.8 mm, diam. 21 mm; right, *Calliostoma hendersoni* Dall, Sta. T-10.

rays on a white ground color; base with five yellow-brown spiral stripes, the peripheral and umbilical ones the weakest. Umbilicus rather widely open, deep, bounded by a white spiral cord of smooth callus extending from the end of the columella.

Measurements.—Height 16.8 mm, greatest diameter 21 mm.

Holotype.—USNM No. 700002, PILLSBURY Sta. P-876.

Type-Locality.—PILLSBURY Sta. P-876. Lesser Antilles, SW of St. Vincent, 13°13.9'N, 61°04.7'W, 231-258 meters, 6 July 1969.

Remarks.—Similar to *Calliostoma hendersoni* Dall in general appearance, but differs by its smooth base, more numerous spiral cords, and striking coloration.

Known only from a single, somewhat damaged specimen.

4. *Calliostoma (Kombologion) hendersoni* Dall

Fig. 4, (right)

Calliostoma hendersoni Dall, 1927, Proc. U. S. natn. Mus., 70: 7.*Calliostoma (Kombologion) hendersoni*, Clench & Turner, 1960, Johnsonia, 4(40): 43, pl. 7, fig. 4; pl. 11, fig. 2; pl. 28.

Records.—From five stations of R/V GERDA and one of R/V TURSIOPS: G-134, Straits of Florida off the lower keys (position not recorded, 191 m, 21 June 1963; 1).—G-482, Straits of Florida (24°29'N, 80°54'W, 201-210 m, 26 January 1965; 1).—G-813, Straits of Florida (24°31.5'N, 80°40'W, 201 m, 21 June 1967; 3).—G-839, Straits of Florida (24°23'N, 80°52'W, 236-229 m, 11 July 1967; 1).—G-866, Straits of Florida (24°28'N, 81°09'W, 186 m, 29 August 1967; 1).—T-10, off Alligator Reef Lighthouse (position not recorded, 133-154 m, 23 June 1966; 1).

Remarks.—Previously known only from two localities in the Straits of Florida (8 miles SE of Key West in 118 fms = 216 m; and 8 miles NE of Cay Sal Bank, 24°03'N, 80°30'W, 150 fms = 274 m, OREGON Sta. 1349).

5. *Lischkeia deichmannae* n. sp.

Fig. 5

Description.—Shell elevated, trochoid in shape, conspicuously sculptured, rather large but thin and light in construction; height 54 mm, maximal diameter 42 mm. Nuclear whorls missing, about 8½ postnuclear whorls remaining. Spire extended, produced at an angle of 58°; suture impressed in a distinct channel; whorls convex, shouldered. Two spiral cords set with prominent conical nodules delimit a broad, flat periphery. A pair of weak spirals, thickened at intervals where they are crossed by axial lamellae, bounds a narrow, flat shelf adjacent to the suture, which is developed a short distance below the lower peripheral cord. This results in a distinct channel containing the suture, which develops along a spiral that becomes nodose on the last half of the body whorl and forms a distinct boundary for the base. Base moderately convex, ornamented with ten spiral cords that become nodose toward the edge of the outer lip. Axial sculpture consists of conspicuous, thin, undulating and anastomosing, raised lamellae which, in turn, are marked with microscopic growth lines. Aperture sub-circular, with a thickened, reflected outer lip evidently indicative of maximal growth, produced at an angle of about 45° from the base. Columella arched, smooth, without teeth. Parietal wall with a thin glaze that is nacreous on the pillar and in an area adjacent to the sutural angle, but porcellaneous in the intervening area. Inside of outer lip nacreous. Outer surface creamy white, semiopaque, possibly allowing a nacreous lustre to show through in living material.

Holotype.—USNM No. 700003, Sta. P-889.

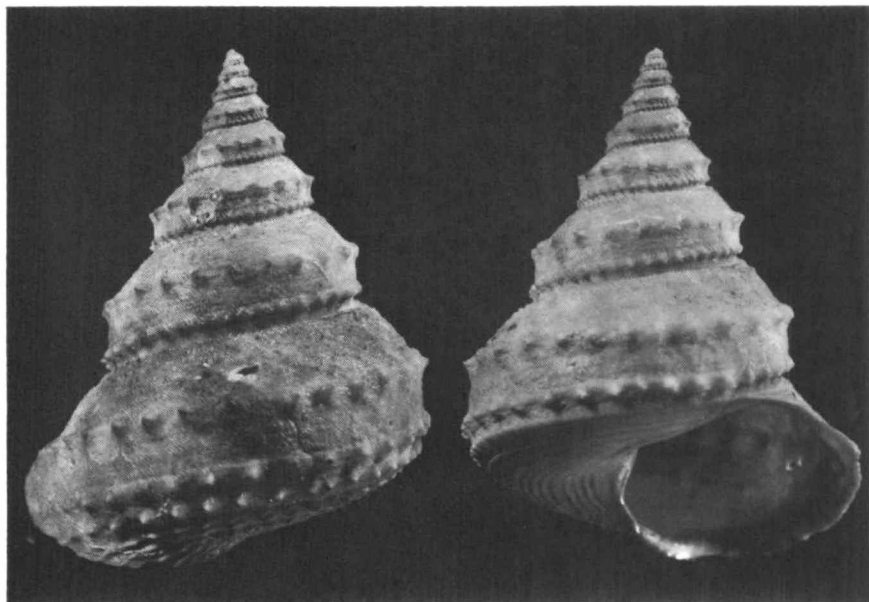


FIGURE 5. Trochidae. *Lischkeia deichmannae*, n. sp., holotype, Sta. P-889, height 54 mm, diam. 42 mm.

Type-Locality.—R/V PILLSBURY Sta. P-889, off St. Lucia, Lesser Antilles: 14°04.4'N, 60°50.8'W, 371-403 meters, 7 July 1969.

Record.—GERDA Sta. G-897, off Arrowsmith Bank, Yucatan, 20°59'N, 86°24'W, 293-210 m, 10 September 1967. A fragmentary specimen consisting of the thickened palatal lip and part of the base.

Comparisons.—On first sight, *Lischkeia deichmannae* is strikingly similar to the type-species, *L. monilifera* (Lamarck) (= *L. alwinae* Lischke) from Japan. Comparison of specimens reveals significant differences, however. In *L. deichmannae* the spire is more extended, the base more inflated and convex, and the umbilical callus completely seals over the umbilical depression. In *L. monilifera*, the edge of the callus is free so that the shallow spiral channel bordering the columella is roofed over by its advancing edge but remains open terminally. Also, in *L. monilifera* the spiral cords are more distinct, beaded at their intersections with narrow axial cords. In *L. deichmannae*, the spiral sculpture is obscure except for the two prominently nodulose cords above and below the periphery and those on the base, and the lamellate axial sculpture is very conspicuous. Specimens of *L. monilifera* from Sagami Bay, Honshu, Japan, in the collections of the

National Museum of Natural History (343262) have a height of 37.6 mm, diameter 33.8 mm, angle of spire 73°. From Tosa Bay, Shikoku, 70 fms = 128 m (605948), height 45.5 mm, diameter 44 mm; height 36.7 mm, diameter 32.8 mm; and height 37.8 mm, diameter 34.5 mm. From Tanabe, Kii, Honshu (273648), height 35.2 mm, diameter 31.5 mm; and height 35.8 mm, diameter 32 mm.

Lischkeia deichmannae more closely resembles a specimen of *Lischkeia* from off Ternate (ALBATROSS Sta. 5617, 131 fms = 240 m; USNM No. 239250), which has a similarly elevated spire, more convex base, and raised axial lamellae. In this example, however, the spiral sculpture is distinctly developed, the base is not so sharply set off from the side of the body whorl, and the major spiral cords on the peripheral half of the base are strongly nodose.

Genus *Basilissa* Watson

Basilissa Watson, 1879, Journ. Linn. Soc. Lond. 15: 593; 1886, Rep. Sci. Res. Challenger, Zool., 15 (Part 42): 96.—Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 383.—Cotton, 1959, South Australian Mollusca, Archaeogastropoda: 189.—Knight *et al.*, 1960, Treat. Invert. Paleont. 1(1): 250.

Type-Species.—*Basilissa superba* Watson, by subsequent designation: Cossmann, 1888.

Description.—See Dall, 1889a; Cotton, 1959.

Remarks.—These shells resemble a small, iridescent *Calliostoma*, but are characterized by a wide, moderately deep sinus in the outer lip near the suture and another below the periphery, in the basal part of the margin, resulting in a clawlike peripheral projection of the outer lip.

Infrequently noticed because of their small size, specimens of these shells have been secured by R/V PILLSBURY and R/V GERDA at a number of stations in the Straits of Florida. Members of the related genera *Seguenzia* and *Fluxina* also were obtained. As in previous collections, most of the specimens were dead and somewhat damaged, although a few examples of *Basilissa* were taken alive. The material shows that *Fluxina discula* Dall differs in no significant regard from the genus *Basilissa*. The shells are distinctly nacreous when wet, although they take on a porcellaneous appearance upon drying. Moreover, *Seguenzia costulata* differs from *Basilissa* only in having a stronger columellar fold and more deeply sinuate lip, thus forming a transition between the genera as already noticed by Dall.

6. *Basilissa alta* Watson

Figs. 6, D-G; 7

Basilissa alta Watson, 1879, Journ. Linn. Soc. Lond., 15: 597.—Dall, 1881, Bull. Mus. comp. Zool. Harv., 9(2): 48; 1889a, Bull. Mus. comp. Zool. Harv., 18: 384.

Seguenzia delicatula Dall, 1881, Bull. Mus. comp. Zool. Harv., 9(2): 48.

Basilissa alta var. *Oxytoma* Watson, 1885, Rep. Sci. Res. Challenger, Zool. 15 (part 42): 100, pl. 7, fig. 8e.

Basilissa alta var. *delicatula* Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 384, pl. 22, figs. 2, 2a; 1889b, Bull. U. S. natn. Mus. 37: 164, pl. 22, figs. 2, 2a (no descr., fig. from 1889a).

Material Examined.—Twenty-seven specimens from the following stations of R/V PILLSBURY and R/V GERDA: P-861 (12°42'N, 61°05.5'W, 18-744 m, 4 July 1969; 1).—P-1255 (17°18'N, 78°32'W, 805-722 m, 14 July 1970; 2).—P-1261 (17°13'N, 77°50'W, 722-768 m, 15 July 1970; 4).—G-365 (24°11'N, 81°37'W, 672 m, 15 September 1964; 1).—G-370 (23°54'N, 81°19'W, 1281 m, 16 September 1964; 1).—G-478 (24°15'N, 82°11'W, 543-348 m, 26 January 1965; 1).—G-815 (24°08'N, 79°48'W, 618 m, 22 June 1967; 1).—G-959 (23°25'N, 82°35'W, 1829 m, 31 January 1968; 5).—G-960 (23°30'N, 82°26'W, 1697-1692 m, 31 January 1968; 6).—G-964 (23°46'N, 81°51'W, 1390-1414 m, 1 February 1968; 1).—G-966 (24°10'N, 82°22'W, 553-558 m, 2 February 1968; 1).—G-967 (24°15'N, 82°26'W, 499-503 m, 2 February 1968; 3).

Remarks.—All of the specimens noted above agree well with the descriptions given by Watson (1878, 1885) for the species and by Dall (1881, 1889a) for the "variety" *delicatula*. The latter was distinguished from *alta* (Dall, 1889a: 384) by its thinner shell and the presence of fine spirals over the whole surface of the whorls. As Watson recognized a variety *oxytoma* with sculpture more distinct than in *alta*, and as the present material shows considerable variation in this regard, it is preferable to treat them all under the name *alta*. The specimens vary also as to relative height of the shell. In Watson's original material from off Culebra Island, east of Puerto Rico, $h/a = 1.04$, whereas in Dall's *delicatula* it is 0.83. In the present material, h/a ranges from 0.82 (Sta. G-964) to 0.99 (Sta. G-966), very closely paralleling the specimens previously reported.

The radula (Fig. 7) has a rachidian with a triangular cusp finely denticulated on the sides, a wide lateral with an inwardly directly triangular cusp denticulated on both sides, and several (6 or 7) marginals, flat and rather narrow, denticulated along most of the outer edge but on the inner edge only near the tip.

The operculum is circular, very thin, concave, of about four whorls.

***Thelyssa*, new genus**

Description.—Shell resembling that of *Basilissa*, nacreous under a porcelainous layer, small, conical, with nearly flat base and rhomboidal aperture, broadly umbilicate; outer lip with a shallow sinus adjacent to the suture and another, broad and shallow, in the peripheral half of the basal part;

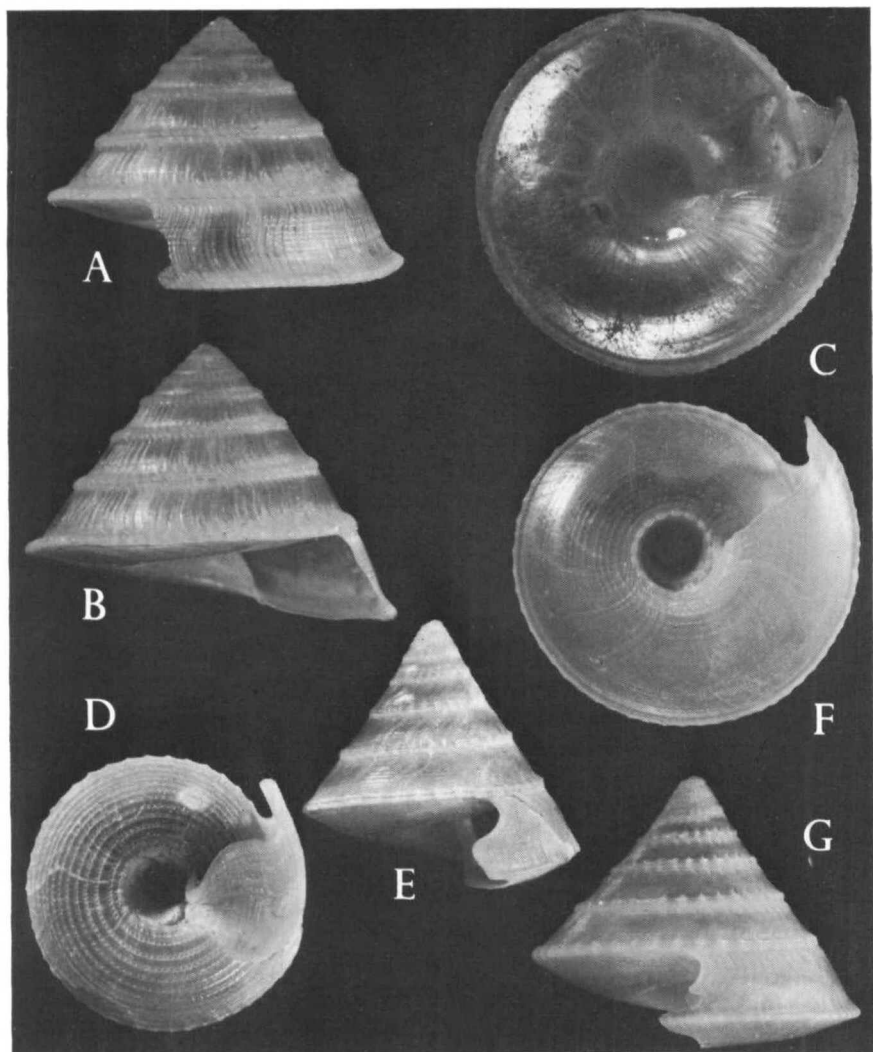


FIGURE 6. Trochidae. A-C, *Thelyssa callisto*, holotype, Sta. P-1138, height 5.8 mm, diam. 7.6 mm.—D-E, *Basilissa alta* Watson, Sta. P-861, height 5.55 mm, diam. 5.8 mm.—F-G, *Basilissa alta* Watson ("var. *delicatula*" Dall), Sta. G-964, height 5.75 mm, diam. 6.95 mm.

columella with a blunt terminal tubercle but not strongly toothed, columellar lip reflected as a band of callus within the umbilicus, subsequently forming a callous septum completely sealing the umbilical opening in fully developed shells.

Type-Species.—*Thelyssa callisto*, n. sp., here designated.

Gender.—Feminine.

Remarks.—The peculiar band of callus laid down within the umbilicus behind the columella, and the final closure of the umbilicus by a smooth callous septum are highly distinctive features; the former extends high within the spire and would be visible even in young shells without the umbilical septum or in shells having the septum broken away.

7. ***Thelyssa callisto***, new species

Fig. 6, A-C

Description.—Shell small, conical, spire with weakly convex sides, base almost flat; glossy, translucent, white, brilliantly iridescent when wet but outer layer becoming milky and porcellaneous when dry, thus obscuring the iridescence. Whorls eight: nucleus of about $1\frac{1}{4}$ smooth, rounded, glassy whorls; postnuclear whorls sculptured, peripherally carinate, weakly concave above the carina and weakly convex below the suture. Postnuclear whorls with numerous narrow, sigmoid axial ribs corresponding in contour with the microscopic lines of growth, each forming a low, rounded, oblique ridge where it passes over the periphery, continuing indistinctly across the base in a wide sigmoid curve. First five postnuclear whorls without spiral sculpture except for three narrow raised cords on the carina; late in the seventh whorl, low, narrow spiral threads appear above the peripheral carina, increasing in number to about 14 immediately behind the outer lip. Base with exceedingly fine spiral threads, those near the periphery more distinct than the rest. Umbilicus funnel-shaped, wide, bounded by a strong spiral cord beaded by the axial (i.e., transverse) riblets; within the umbilicus, sutures between the whorls deeply impressed. Aperture rhomboidal; outer lip sharp, with a shallow sinus adjacent to the suture and a broader one on the base near the periphery; columellar lip oblique, terminating in a weak, blunt denticulation, reflected inward as a tongue of callus forming a spiral band within the umbilicus, in the adult shell producing also a smooth, solid callous pad that closes the umbilicus completely; parietal wall with a thick glaze of transparent callus.

Measurements.—Height 5.8 mm, diameter 7.6 mm (holotype); height 5.5 mm, diameter 7.8 mm (paratype); height 5.8 mm (apex damaged), diameter 7.3 mm (paratype).

Holotype.—USNM No. 701215, PILLSBURY Sta. P-1138.

Type-Locality.—PILLSBURY Sta. P-1138, W of Great Inagua Island, 20°51.7'N, 74°22'W, 2745-2751 meters, 12 January 1970.

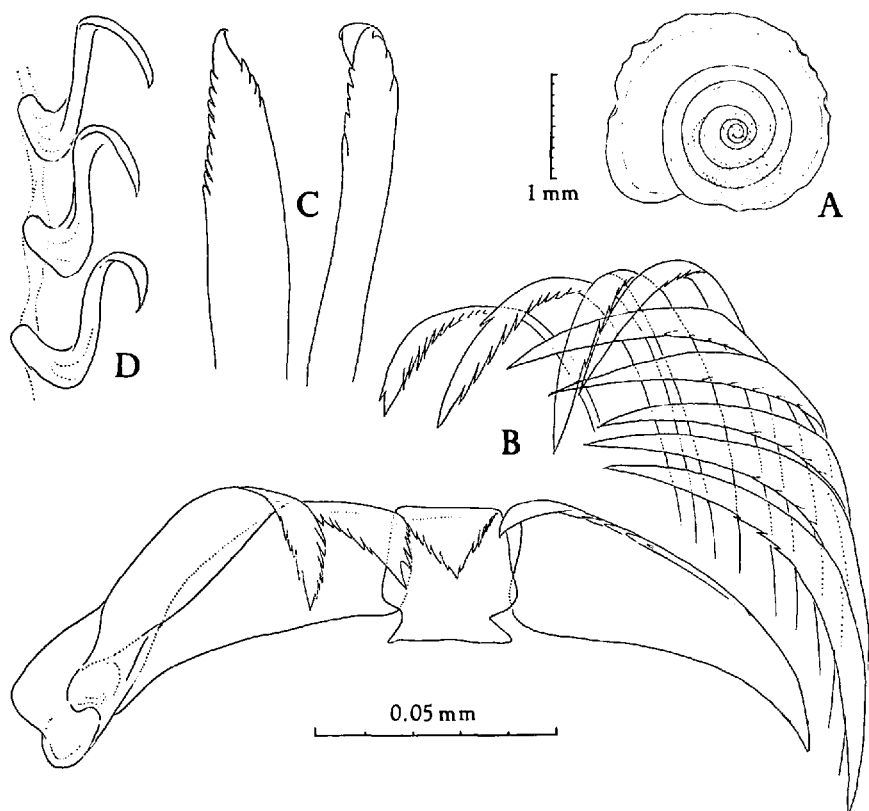


FIGURE 7. Trochidae. *Basilissa alta* Watson, Sta. P-1255: A, operculum; B, radula, bases of marginals not visible (scale applies to all radulae); C, tips of two marginals; D, profile view of rachidians.

Remarks.—This species resembles *Basilissa alta* Watson in size and shape, but the sides of the spire are faintly convex instead of flat or weakly concave, the sigmoid axial riblets are more pronounced, the base is only faintly sculptured, the position of the sinuses differs with the result that the most advanced part of the outer lip is above the periphery, and, above all, the umbilicus is closed by a smooth callous plate in the fully developed shell.

Genus *Fluxina* Dall

Fluxina Dall, 1881, Bull. Mus. comp. Zool. Harv., 9(2): 51.

Description.—Dall, 1881.

Type-Species.—*Fluxina brunnea* Dall, by monotypy.

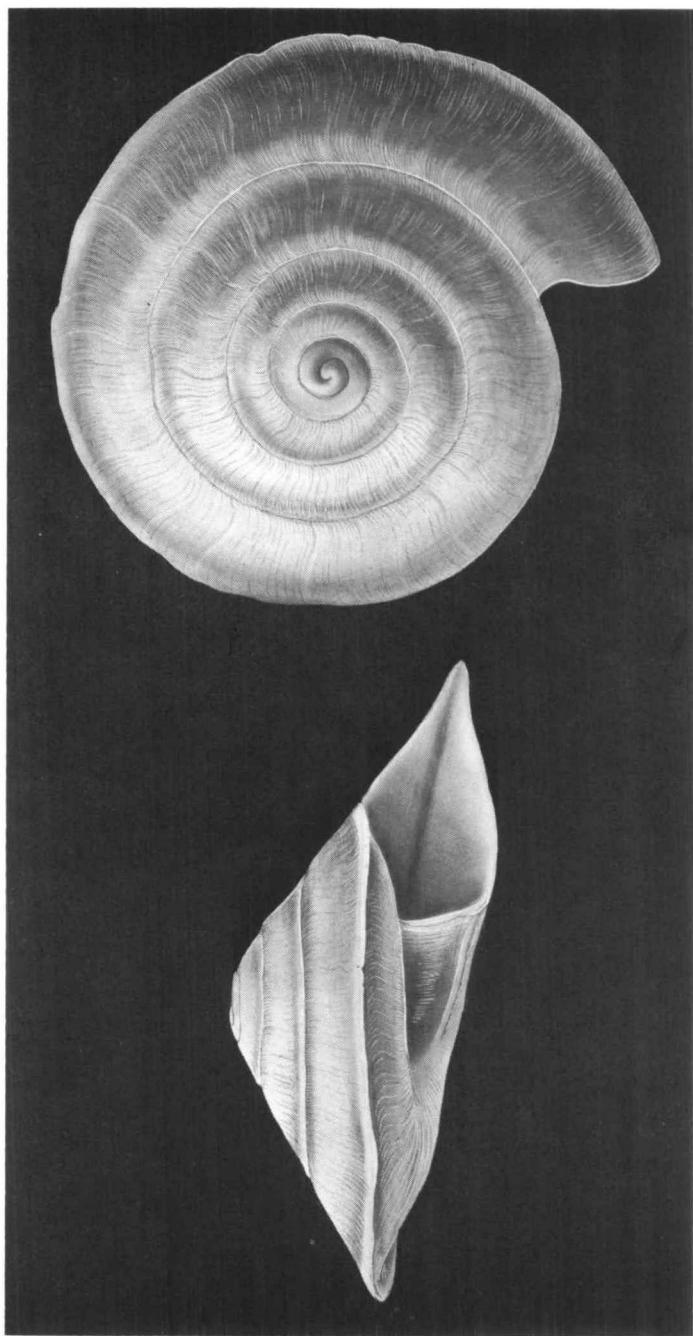


FIGURE 8. Trochidae. *Fluxina discula* Dall, Sta. G-967, height 2.7 mm, diam. 6.4 mm.

Remarks.—The type-species has a large, *Calliostoma*-like shell. *Fluxina discula* Dall, 1889, obviously is close to *Basilissa* Watson, differing chiefly in its depressed spire. As not enough material is at my disposal to determine whether the two species really are congeneric, *F. discula* is provisionally retained in *Fluxina*. It is considered to be trochid, not architectonicid, in its affinity.

8. *Fluxina discula* Dall

Fig. 8

Fluxina discula Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 273, pl. 23, figs. 5-6; 1889b, Bull. U. S. natn. Mus., 37: 148, pl. 23, figs. 5-6 (listed only; figure from 1889a).

Material Examined.—GERDA Sta. G-967, Straits of Florida SW of Marquesas Keys, 24°15'N, 82°26'W, 499-503 m, 2 February 1968; 1 specimen.

Remarks.—Nacreous iridescence clearly shows through the white outer layer of shell when wet, but when dry the shell is opaque, glossy white. Although this specimen was not alive when collected and therefore cannot provide radular characters which would assist in systematic placement, its conchological characters are so distinctly like *Basilissa* that only the great depression of the spire justifies maintaining it apart from that genus.

Fluxina discula was obtained originally from the vicinity of Dominica.

Family Turbinidae

9. *Turbo (Halopsephus) haraldi* Robertson

Figs. 9, 10

Halopsephus pulcher Rehder, 1943, Proc. U. S. natn. Mus., 93(3161): 191, pl. 20, figs. 3, 10.

Turbo (Halopsephus) haraldi Robertson, 1957, J. Wash. Acad. Sci., 47(9): 316, figs. 1-3.

Not *Turbo pulcher* Dillwyn, 1817, Catalogue Shells, 2: 855.

Not *Turbo pulcher* Reeve, 1842, Conch. Systematica, 2: 167.

R/V PILLSBURY obtained this rare species at five stations in the Caribbean area, substantially increasing the known range and suggesting a general distribution in this area. Fifteen specimens, nine in good condition (two collected alive), show that individuals attain a height of 25 mm, over twice the size indicated in the two previous records of the species.

Records.—Sta. P-409, eastern Panama (8°51.2'N, 77°28.1'W, 54-47 m; one dead specimen, height 9 mm, width 8.6 mm).—P-420, off Archipelago de Mulatas, Panama (9°30.5'N, 78°25.6'W, 50 m; one live specimen, height 19.8 mm, width 18 mm).—P-857, east of Carriacou, Lesser Antilles (12°23.5'N, 61°21.6'W, 9-348 m; three dead specimens; height 22.2 mm,

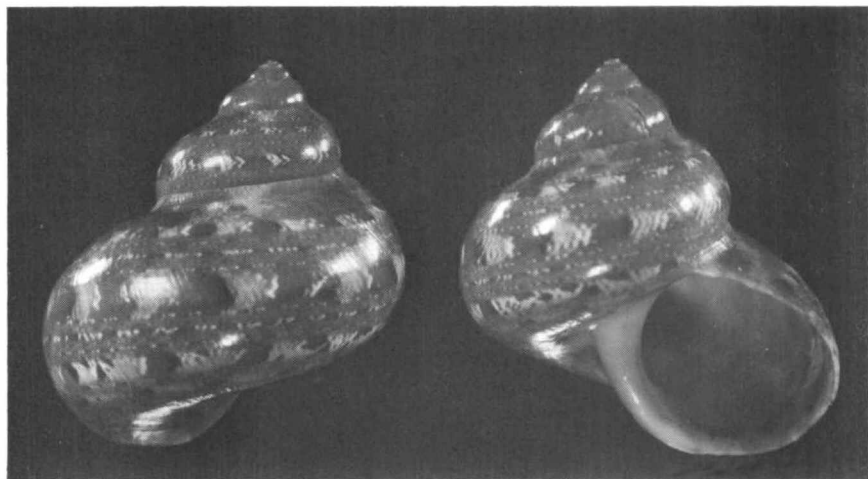


FIGURE 9. Turbinidae. *Turbo haraldi* Robertson, Sta. P-924, height 20.4 mm, width, 18.6 mm.

width 19.6 mm; height 5.9 mm, width 6.1 mm; height 5.4 mm, width 5.9 mm).—P-924, Dominica Channel, Lesser Antilles ($15^{\circ}13.0'N$, $60^{\circ}56.9'W$, 68-69 m; one live specimen, height 20.4 mm, width 18.6 mm; one dead specimen, height 19.9 mm, width 18.6 mm).—P-926, Dominica Channel, Lesser Antilles ($15^{\circ}13.2'N$, $60^{\circ}56.8'W$, 73 m; eight dead specimens, ranging in size from 25 mm high, 22.5 mm wide, to 18.5 mm high, 16.8 mm wide).

Remarks.—The present material shows that adult shells have not been reported previously. The shells strongly resemble small specimens of *Turbo petholatus* Linné and *Turbo reevei* Philippi, but are more reddish or orange in color. The basic color pattern consists of three spiral bands of color darker than the ground color, one on the obscure subsutural spiral cord, one at the periphery, and one equally spaced below the periphery; in some specimens, the base is paler below the lowest spiral band. The spiral bands are interrupted by regularly spaced paler zones which may contain even paler crescentic lines as wide as the band, or groups of pale vertical flecks. Three narrower, less prominent dark spirals separate the adjacent major spirals, and even weaker ones may occur between these; all are interrupted by pale flecks. Narrow, pale axial lines run in the direction of the growth lines and, in some specimens, there are narrow, curved, pale marks extending down from the suture to the subsutural cord. Slight variations in background color produce a generally clouded effect; the color overall may be bright reddish, rusty or ochraceous yellow. Robertson (1957:318) dis-

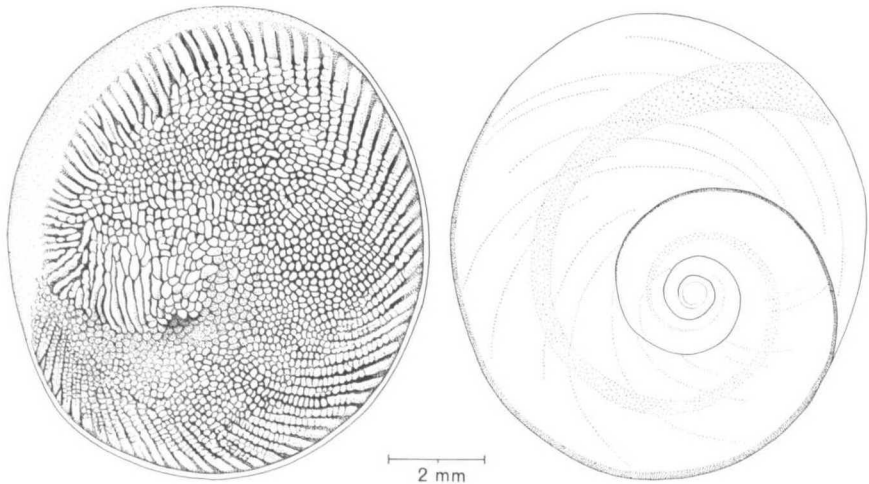


FIGURE 10. Turbinidae. *Turbo haraldi* Robertson, Sta. P-420; operculum. Drawing by Constance S. McSweeney.

tinguished juveniles of *T. haraldi* from those of *T. castanea* by their bright carmine color. However, his intention is not clear as he also described the early nuclear whorls as white. In the present material, the first nuclear whorl is pink, brownish orange, or white, the following whorls pink with more or less white clouding; in a specimen from station P-420, the nucleus and two postnuclear whorls are white, becoming pink in the third whorl.

In some examples, the narrow umbilicus is not closed by the columellar callus.

The distinctive adult operculum, which has not been illustrated previously, is shown in Figure 10. It provides the chief distinguishing character of the subgenus *Halopsephus*, which otherwise is like *Turbo s.s.*

Range.—Bahamas (Robertson), to the Lesser Antilles (Rehder) and Panama (here recorded).

Type-Locality.—Barbados.

Family Epitoniidae

10. *Epitonium (Amaea) mitchelli* (Dall)

Fig. 11, A

Scala mitchelli Dall, 1896, *Nautilus*, 9: 112.

Scala (Amaea) mitchelli, Dall, 1902, *Proc. U. S. natn. Mus.*, 24(1264): 506, pl. 30, figs. 3-4.

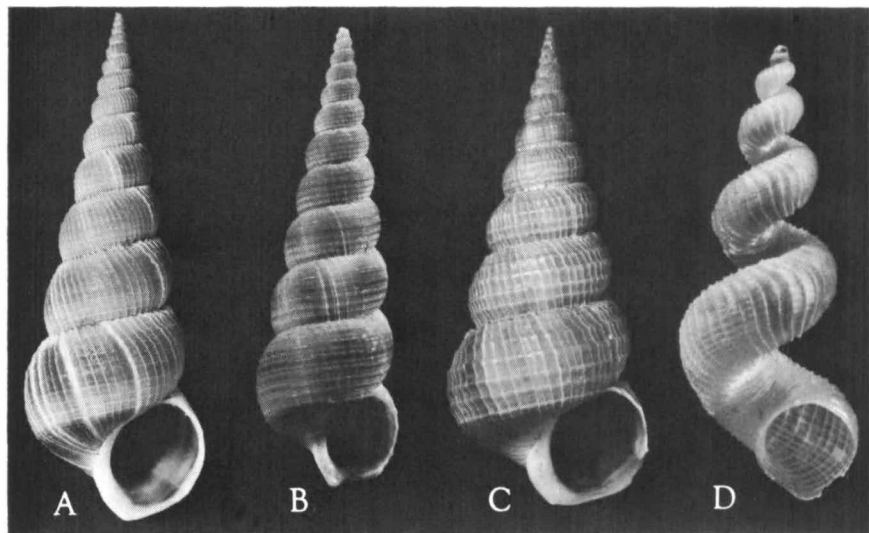


FIGURE 11. Epitoniidae. A, *Epitonium mitchelli* (Dall), Sta. P-324, height 45.2 mm, diam. 16.1 mm; B, *Epitonium brunneopictum* Dall, Sta. P-515, Bay of Panama, height 35.1 mm, diam. 10.9 mm; C, *Epitonium ferminianum* Dall, Sta. P-532, Bay of Panama, height 56.2 mm, diam. 23.5 mm; D, *Epitonium vermetiforme* (Watson), Sta. G-966, height 8.75 mm.

Amaea (*Amaea*) *mitchelli*, Clench & Turner, 1950, *Johnsonia*, 2(29): 243, pl. 106, figs. 5-7 (photo of holotype, additional specimen, and sculptural detail).

Description.—Clench & Turner, 1950.

Holotype.—USNM No. 187792.

Type-Locality.—Matagorda Island, Texas.

Record.—PILLSBURY Sta. P-324. Caribbean coast of Panama: 9°44'N, 79°31'W, 64-55 m, 7 July 1966. One dead specimen, bored by predaceous gastropod but in fresh condition; height 45.2 mm, diameter of body whorl 16.1 mm.

Remarks.—So far as we are aware, this is the first record of this species in the southwestern Caribbean Sea.

Epitonium (*Amaea*) *mitchelli* bears a strong resemblance to the eastern Pacific *Epitonium* (*Ferminoscala*) *ferminianum* Dall, 1908, (Fig. 11, C) and, especially, *E.* (*Ferminoscala*) *brunneopictum* Dall, 1908, (Fig. 11, B) in size, shape, sculpture, and coloration. Although placed in different

genera (or subgenera) by recent authors because of the absence of varices, examination of *E. ferminianum* and *E. brunneopictum* shows that in both species the axial lamellae are stronger at irregular intervals, almost as conspicuously as in *E. mitchelli*. Further, the basal area of the body whorl in *E. mitchelli* is set off by stronger spirals as it is in the two eastern Pacific species, although perhaps not so conspicuously. It appears that the more pronounced differentiation of the "basal disk" in *Scalina* (*Ferminoscala*) has been overemphasized in the search for differences. In my opinion, the distinction between *Amaea* H. & A. Adams, 1853, and *Scalina* Conrad, 1865, (= *Ferminoscala* Dall, 1908) is not justified.

11. *Epitonium* (*Solutiscala*) *vermetiforme* (Watson)

Fig. 11, D

Scalaria vermetiformis Watson, 1886, Rep. Sci. Res. Challenger, Zool., 15: 142, pl. 9, fig. 6.

Solutiscala (*Solutiscala*) *vermetiformis*, Clench & Turner, 1952, Johnsonia, 2(31): 347, pl. 170, figs. 1-2 (original figures reproduced).

Description.—See Clench & Turner, 1952: 347.

Record.—GERDA Sta. G-966. Straits of Florida SW of Marquesas Keys, 24°10'N, 82°22'W, 544-549 meters, 2 February 1968. One dead but nearly perfect specimen, length 8.75 mm, width 3.5 mm.

Remarks.—This species has not been reported since its original description by Watson in 1866. The rather small size and very delicate structure of the shell no doubt account for the lack of subsequent reports.

A shell very similar to this was described as *Delphinula nitida* by Verrill & Smith from ALBATROSS Sta. 2229 (Verrill, 1885: 424, pl. 44, fig. 11). Dall (1889b, pl. 46, fig. 11) reproduced Verrill's plate and referred the species to *Laxispira*. Although the spire of that species is not so extended as in *E. vermetiforme*, the shells are otherwise very close, and it seems likely that they are related if not identical.

Family Cypraeidae

12. *Cypraea* (*Propustularia*) *surinamensis* Perry

Fig. 12

Cypraea surinamensis Perry, 1811, Conchology: pl. 20, no. 4.—Burgess, 1970, Living Cowries: 237, pl. 23, fig. B.

Propustularia surinamensis, Coomans, 1963, Stud. Fauna Curaçao, 15: 63, pl. 2, e-f.

Cypraea (*Propustularia*) *surinamensis*, Emerson & Old, 1965, Nautilus, 79 (1): 26-30, pl. 3, figs. 1-2 (new records; nomenclatural discussion); 1966, Nautilus, 80(2): 70-71 (species reported from Brazil).—Matthews, 1967, Arq. Est. Biol. Mar. Univ. Fed. Ceará, 7(1): 17, figs. 7-8.

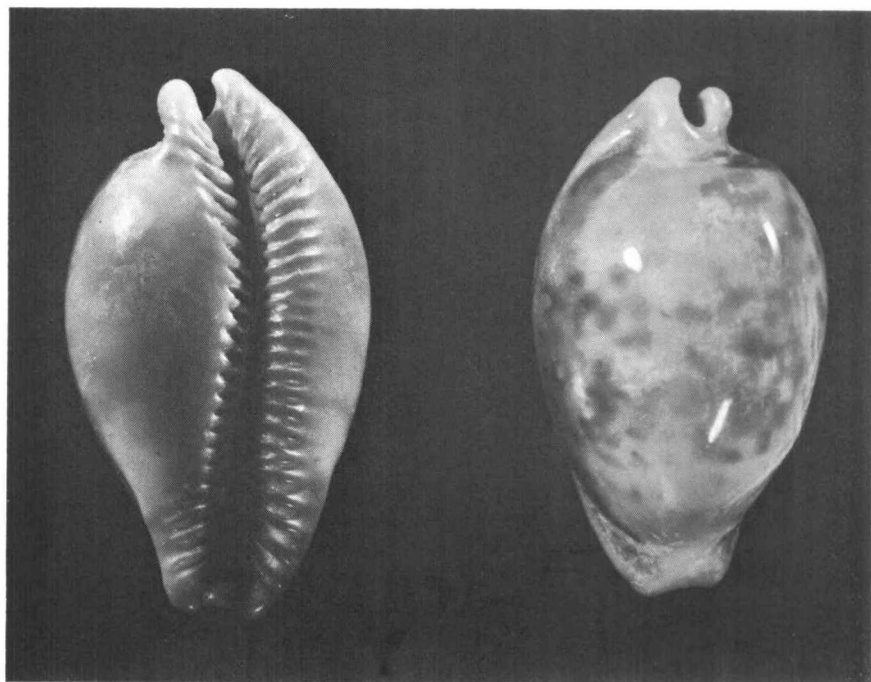


FIGURE 12. Cypraeidae. *Cypraea surinamensis*, Sta. P-581, height 37 mm, width 21 mm.

Record.—PILLSBURY Sta. P-581, off Arrowsmith Bank, Yucatan, 21°05'N, 86°23'W, 146-265 m, 22 May 1967. One specimen, "long form," length 37 mm, width 21 mm.

Remarks.—The nomenclatural difficulties revolving around this species have been discussed by Coomans (1963) and Emerson & Old (1965).

Modern records from the Florida Keys, Yucatan, and Brazil confirm that *C. surinamensis* has a rather wide range in the tropical western Atlantic.

Family Cassididae

Genus *Bathygalea* Woodring & Olsson, 1957

Bathygalea Woodring & Olsson, 1957, Prof. Pap. U. S. Geol. Survey No. 314-B: 22.

Description.—See Woodring & Olsson, 1957.

Type-Species.—*Cassis coronadoi* Crosse, by original designation.

13. *Bathygalea coronadoi* (Crosse, 1867)

Figs. 13; 17, C

Cassis coronadoi Crosse, 1867, Journ. Conchyl., 15: 64, pl. 4, fig. 1; pl. 5, fig. 1 (Matanzas, Cuba).

Galeodea coronadoi, Dall, 1889a, Bull. Mus. Comp. Zool. Harv., 18: 231 (40 miles off Cape Fear, N. C., 124 fathoms, ALBATROSS Sta. 2603).—Clench, 1944, Johnsonia, 1(16): 4, pl. 2 (citations of earlier records).

Bathygalea coronadoi, Woodring & Olsson, 1957, Prof. Pap. U. S. Geol. Survey No. 314-B: 24, pl. 9, figs. 2-3 (description and figure of specimen reported by Dall, 1899a).

Material Examined.—PILLSBURY Sta. P-739. Venezuela, NW of Isla Centinela: 10°54.7'N, 66°17.8'W, 234-280 meters, 23 July 1968. Two living specimens: length 62.9 mm, width 42.7 mm; length 49.5 mm, width 34.8 mm.

R/V JOHN ELLIOTT PILLSBURY obtained two living examples of *Bathygalea coronadoi* (Crosse) at trawling station P-739 about 50 miles northeast of Caracas, Venezuela, the third record of this species and the first specimens to be obtained alive. This record extends the known geographical range considerably to the southward and indicates a general distribution in the Caribbean area. Although Woodring & Olsson attributed the paucity of records to inadequate exploration in the tropical western Atlantic, the many trawling stations occupied in the region by vessels of the School of Marine and Atmospheric Sciences without obtaining additional specimens seem to indicate scarcity.

Because of the great rarity of *Bathygalea coronadoi* in scientific collections, we present herewith photographs of both examples, and some elaborations upon the description given by Woodring & Olsson (1957).

Description.—Both specimens are immature and lack the reflected outer lip of fully developed individuals. The smaller specimen, 49.5 mm in length, retains the nuclear whorls although they are somewhat weathered. There are slightly over three helicoid, inflated whorls apparently lacking sculpture, ending with a distinct axial riblet. Spiral sculpture, including the nodulose shoulder, commences on the first postnuclear whorl. Axial growth lines and weak, narrow axial swellings are distinctly visible on the second postnuclear whorl but are obliterated on the first by wear. About six flattened spiral cords, including that at the shoulder, occur early in the second postnuclear whorl, increasing in number by intercalation as the whorls enlarge. On the body whorl they are numerous, low, flattened, separated by roughly their own width. The three low spiral swellings on the body whorl of the two previously known specimens, noted by Woodring & Olsson (1957: 24) have not appeared on the present examples, although the upper one is incipient. The color is light brown with indistinct paler spiral bands and

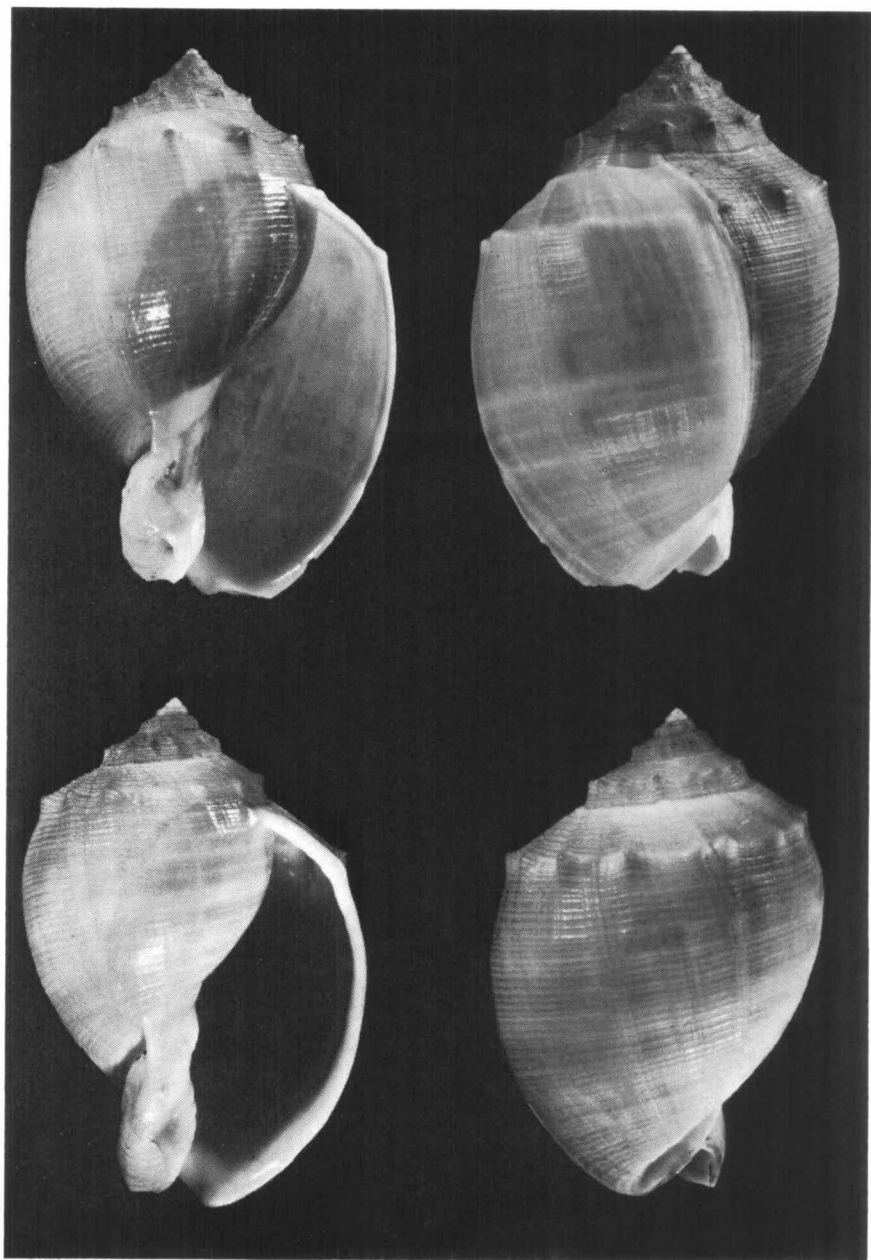


FIGURE 13. Cassididae. *Bathygalea coronadoi* (Crosse), Sta. P-739: upper, length 62.9 mm, width 42.7 mm; lower, length 49.5 mm, width 34.8 mm.

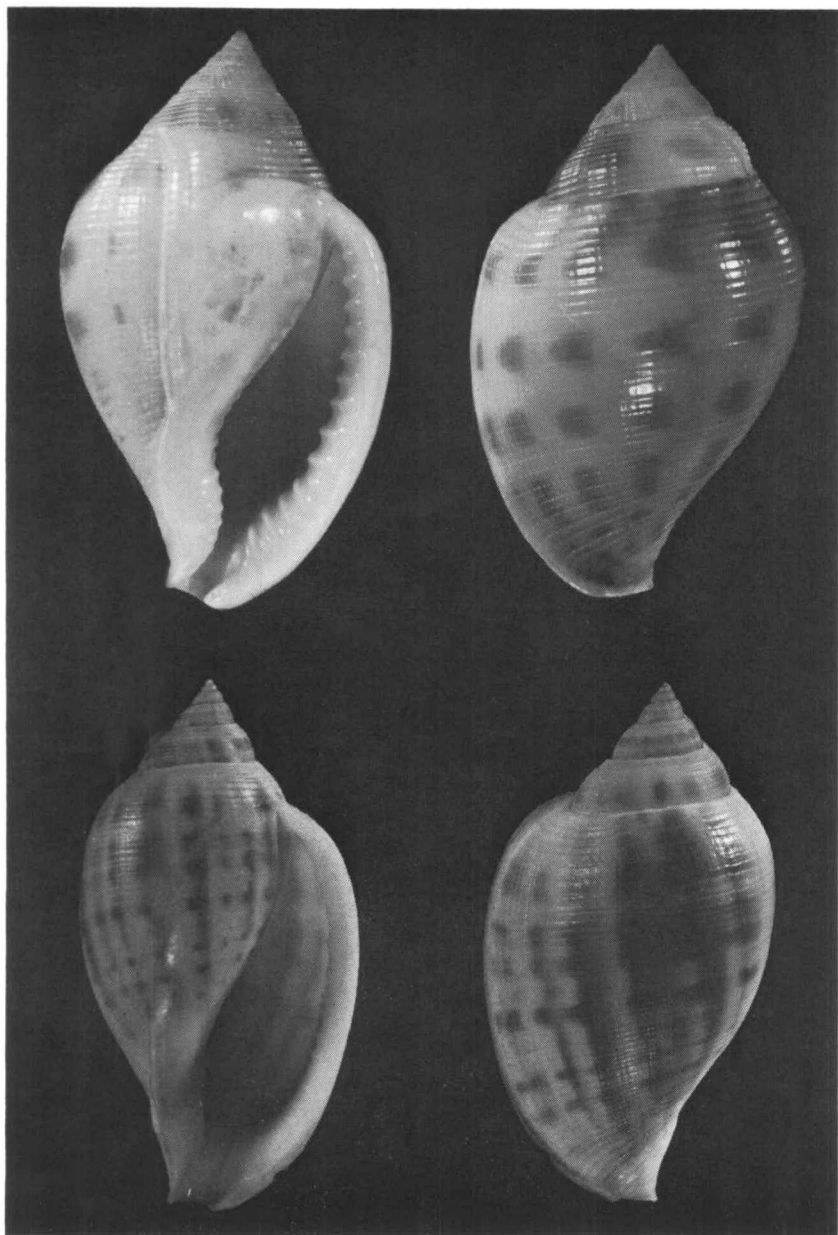


FIGURE 14. Cassididae. *Sconsia striata* (Lamarck): upper, Sta. P-1232, height 46.6 mm, width 27.7 mm; lower, Sta. P-353, height 42.8 mm, width 24 mm.

faint axial streaks a little darker than the ground color. The larger specimen is discolored a ferruginous brown on all parts up to a major pause in growth on the body whorl.

Operculum shaped like that of *Phalium*, the free margin as in *Phalium cicatricosum* without serrations.

Genus *Sconsia* Gray

Sconsia Gray, 1847, Proc. Zool. Soc. Lond., 15: 137.—Clench & Abbott, 1943, *Johnsonia*, 1(9): 6.

This genus has been reviewed by Clench & Abbott (1943). Until now, it has been known to contain only one rather variable species in the Caribbean area, extending from the Straits of Florida southward to Barbados and Panama. Trawling operations by R/V GERDA and R/V PILLSBURY have obtained several records of this species, and the latter vessel has collected a distinctive new species of the genus.

14. *Sconsia striata* (Lamarck, 1816)

Figs. 14; 17, A; 20, D

Cassidaria striata Lamarck, 1816, Encyclopédie Méthodique, Vers, 3: 3, pl. 405, figs. 2a, b.

Sconsia striata, Clench & Abbott, 1943, *Johnsonia*, 1(9): 6, pl. 4, figs. 1-4.

—Clench, 1959, *Johnsonia*, 3(39): 329, pl. 172 (photo of holotype of *Sconsia barbudensis* Higgins & Marratt).

Material Examined.—GERDA Sta. 236, Straits of Florida, W of Riding Rocks (25°15'N, 79°15'W, 384 meters, 30 January 1964; 1).—G-272, Straits of Florida, S of Gun Cay (25°28'N, 79°18'W, 384-357 m, 30 March 1964; 1).—G-390, Straits of Florida, W of Little Bahama Bank (27°19'N, 79°11'W, 247-275 m, 19 September 1964; 1).—G-503, W of Pinder Point, Grand Bahama I. (26°31'N, 78°51'W, 366 m, 4 February 1965; 1).—G-625, Straits of Florida, NW of Bimini (25°53'N, 79°19'W, 384-412 m, 29 June 1965; 1).—G-638, Straits of Florida at entrance of Northwest Providence Channel (26°05'N, 79°12'W, 238-256 m, 30 June 1965, 2 juv.).—G-725, Northwest Providence Channel (26°01'N, 79°10'W, 210-143 m, 3 August 1965; 2 broken).

Also, eleven specimens, four of them broken, from eight PILLSBURY stations in the southwestern Caribbean Sea: P-349, P-353, P-361, P-362, P-365, P-366, P-367, P-783; seven specimens, one broken, from five PILLSBURY stations off the coast of Venezuela: P-714, P-716, P-752, P-756, P-760; one from the Lesser Antilles between Grenada and Trinidad, P-849; and one and fragments from off the southwest coast of Jamaica, P-1232.

Remarks.—The shells vary considerably as to color pattern and sculpture.

15. *Sconsia nephele*, n. sp.

Fig. 15

Description.—Shell ovate, imperforate, rather thin and glossy. The only known specimen, 37.8 mm long, has six whorls and therefore probably is not fully grown. The spire is low, flat-sided, with only slightly impressed sutures, produced at an angle of 94° . Nuclear whorls smooth, postnuclear whorls with distinct spiral grooves, seven in number on the third, fourth, and fifth whorls. On the body whorl, the grooves near the suture and the base remain distinct, but those in the middle of the whorl become rather weak and show a somewhat irregular alternation of weaker and stronger, the total number being about 40. Besides faint axial growth lines, there are slightly raised axial riblets that become stronger toward the end of the last whorl, thus producing a distinct cancellation especially noticeable anteriorly. Last whorl with one varix; outer lip thickened, denticulate within, showing evidence of continuing growth, not reflected. Parietal wall glazed in an area clearly shown in Figure 15.

Ground color nearly uniform ochre, with faint evidence of a few localized darker axial streaks following lines of growth. Pattern consisting of eight spiral bands of darker brown (burnt ochre) regularly interrupted with squarish spots of white. Varix and outer lip marked by seven elongated, rectangular spots of darker brown (umber) which alternate with the color bands.

Operculum not seen; specimen dead, but shell in fresh condition.

Holotype.—USNM No. 700004, from PILLSBURY Sta. P-851.

Type-Locality.—PILLSBURY Sta. P-851, southwest of the island of Grenada, $11^\circ 52.8'N$, $61^\circ 53.3'W$, depth 18 meters, 3 July 1969.

Remarks.—Compared with *Sconsia striata* (Lamarck) of similar size, the shell is more broadly ovate, the spire lower, the spiral grooves more distant and less distinct, and the color pattern quite different from any variations recorded in the literature or observed in specimens.

16. *Morum (Cancellomorum) dennisoni* (Reeve)

Figs. 16; 17, B

Morum dennisoni, Clench & Abbott, 1943, *Johnsonia*, 1(9): 5, pl. 4, fig. 5.

—Dance, 1966, *Shell Collecting*: pl. 22c; 1969, *Rare Shells*: 80, pl. 13a (color photo of holotype).

Morum (Cancellomorum) dennisoni, Emerson, 1967, *Veliger*, 9(3): pl. 39, figs. 1a, 1b (photo of "cotype").—Dance & Emerson, 1967, *Veliger*, 10(2): 91-94, pl. 12, figs. 5-7 (photo of holotype; copy of original illustration of holotype).

Material Examined.—Represented at six PILLSBURY stations, as follows: P-581, Arrowsmith Bank, Yucatan ($21^\circ 05'N$, $86^\circ 23'W$, 146-265 m, 22

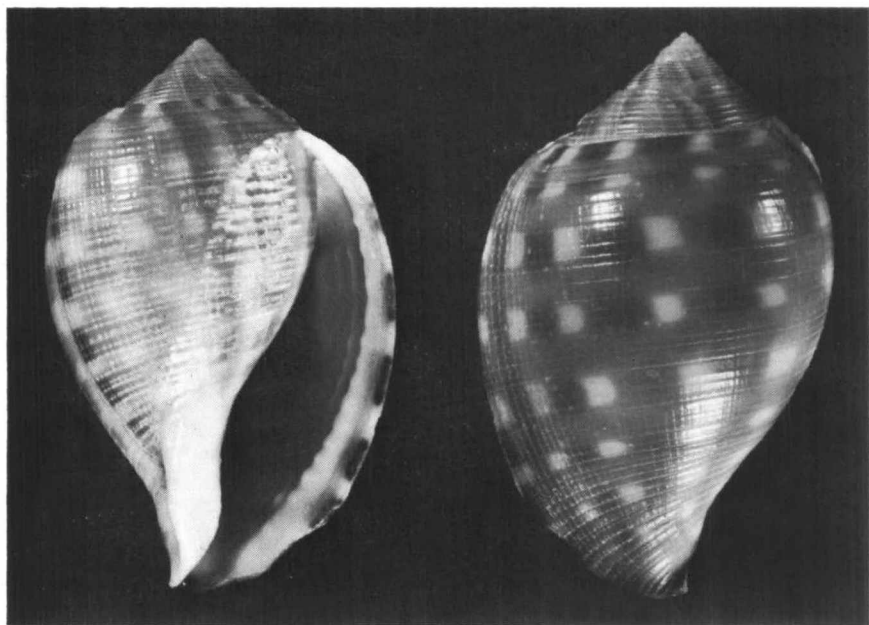


FIGURE 15. Cassididae. *Sconsia nephele*, n. sp., holotype, Sta. P-851, height 37.8 mm, width 24 mm.

May 1967; 2).—P-598, Arrowsmith Bank, Yucatan ($21^{\circ}07'N$, $86^{\circ}21'W$, 155-205 m, 15 March 1968; 1).—P-734, off Isla Tortuga, Venezuela ($11^{\circ}01.8'N$, $65^{\circ}34.2'W$, 68-60 m, 22 July 1968; frag.).—P-772, off Guajira Peninsula, Colombia ($12^{\circ}20.2'N$, $71^{\circ}55.1'W$, 11 m, 29 July 1968; 1).—P-835, SE of Trinidad ($9^{\circ}36'N$, $60^{\circ}10'W$, 48 m, 30 June 1969; 1).—P-916, Guadeloupe ($16^{\circ}22.2'N$, $61^{\circ}26.3'W$, 2 m, 11 July 1969; 2).

Remarks.—In the above material, all specimens but that from P-772 are similar to the material taken by the ALBATROSS at Arrowsmith Bank, Yucatan (Sta. 2354, USNM No. 93742) and to a specimen from Barbados (USNM No. 459829). These are similar to the original specimens of *O. dennisoni* as figured by Dance (1966, 1969), Emerson (1967), and Dance & Emerson (1967), but the axial ribs are not as well developed so that the sculpture is less distinctly cancellate (Fig. 16). The shell from Sta. P-772 (Fig. 16), which is more prominently cancellate and differs in shape, appears to be specifically distinct when considered in the light of the present collection only. However, as the published figures of *M. dennisoni* show some sculptural variation, and as so few specimens are available for comparison, this specimen is not given specific recognition at the present time.

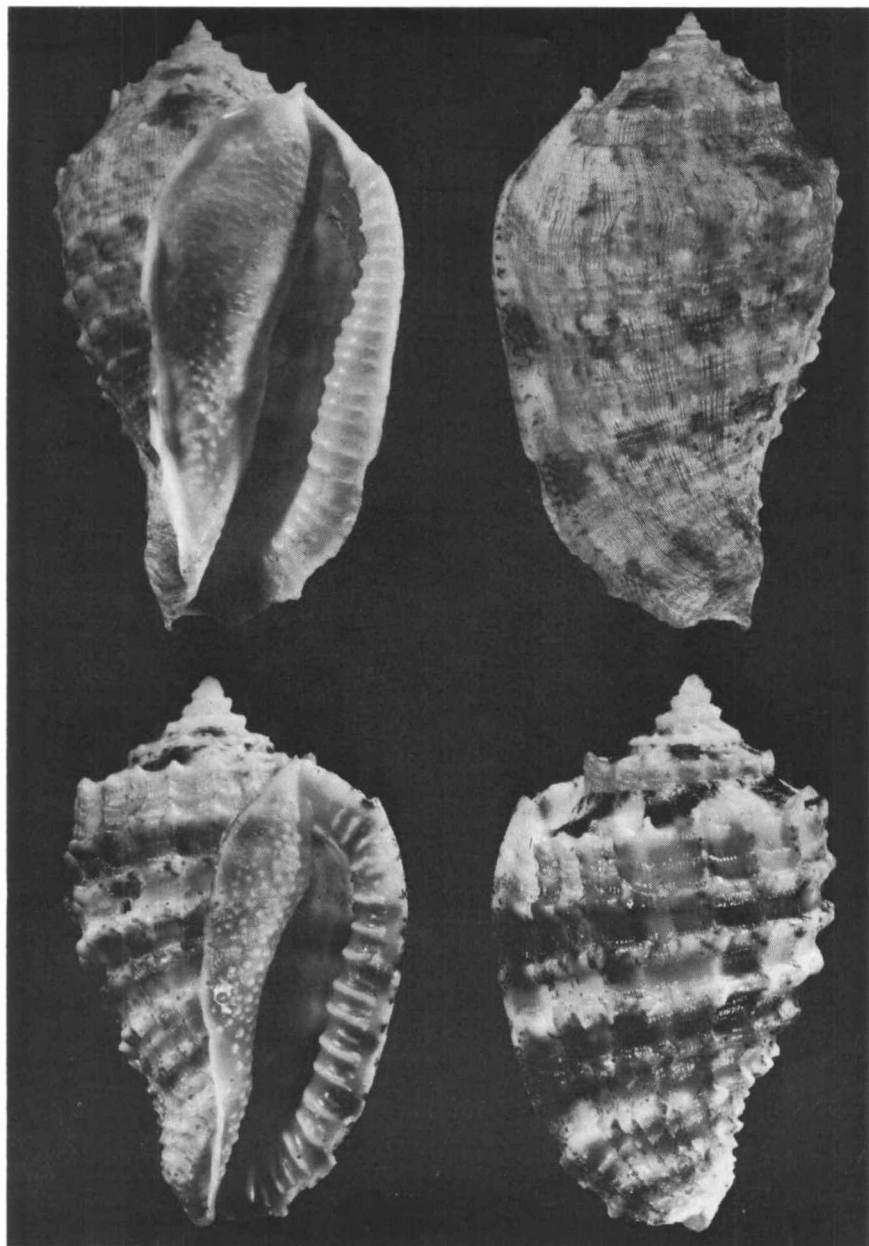


FIGURE 16. Cassididae. *Morum dennisoni* Reeve: upper, Sta. P-581, height 50.5 mm, width 29.2 mm; lower, Sta. P-772, height 34.6 mm, width 21.9 mm.

Family Oocorythidae

17. *Oocorys sulcata* Fischer, 1883

Figs. 18; 19; 20, B, C; 22, B

Oocorys sulcata Fischer, 1883, Journ. Conchyl., 31: 392.—Watson, 1886, Rep. Sci. Res. Challenger, Zool., 15: 412, pl. 17, fig. 11.—Locard, 1897, Expéd. Scient. Travailleur et Talisman, Mollusques Testacés, 1: 288.—Turner, 1948, Johnsonia, 2(26): 186, pl. 75, fig. 8 (operculum); pl. 85, figs. 1-2 (shells).

Oocorys sulcata var. *minor* Locard, 1897, Expéd. Scient. Travailleur et Talisman, Mollusques Testacés, 1: 290.

Oocorys sulcata var. *elongata* Locard, 1897, Expéd. Scient. Travailleur et Talisman, Mollusques Testacés, 1: 291.

Records.—EASTERN ATLANTIC: PILLSBURY stations P-18 (5°01'N, 00°12'E, 3047-3129 m, 26 May 1964; 3).—P-44 (5°05'N, 4°00'W, 586-403 m, 30 May 1964; 3).

WESTERN ATLANTIC: PILLSBURY stations P-325 (9°52'N, 79°35.5'W, 1774-1656 m, 7 July 1966; 1).—P-346 (9°54.5'N, 77°03'W, 2950-2938 m; 1).—P-374 (9°57'N, 76°10.6'W, 434-373 m, 14 July 1966; 1).—P-586 (23°32'N, 82°33'W, 1737-1682 m, 24 May 1967; 1).—P-680 (8°42'N, 55°48'W, 3014-3239 m, 13 July 1968; 2).—P-681 (8°11.5'N, 56°12'W, 2672-2736 m, 14 July 1968; 3).—P-719 (11°35'N, 64°35.5'W, 1409-1629 m, 20 July 1968; 1).—P-748 (11°24.8'N, 67°10.1'W, 1867-1784 m, 25 July 1968; 14).—P-844 (11°30'N, 60°14.5'W, 1464-1848 m, 1 July 1969; 2).—P-1178 (19°14'N, 73°14'W, 1798-1902 m, 30 June 1970; 6).—P-1180 (18°55'N, 73°53'W, 3493-3109 m, 1 July 1970; 4).

Remarks.—Specimens from the West Atlantic are indistinguishable from West African material on conchological grounds, but the radula has one or two conspicuous sharp denticles on the inside of the first (inner) marginal instead of one to three inconspicuous bumps, and both the lateral and rachidian teeth have fewer denticles. Whether these differences are constant, indicating a small degree of differentiation, is impossible to determine now, as so little material has so far been studied. The taxonomic significance of the horny jaws has not been investigated.

Genus *Dalium* Dall, 1889

Dalium Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 230.—Thiele, 1929, Handb. syst. Weichtierkunde, 1: 279.—Clench & Abbott, 1943, Johnsonia, 1(9): 8.

As the operculum and radula were unknown at the time of its original establishment by Dall, this genus was only tentatively placed in the family Oocorythidae. Thiele treated it in the family Cassididae, as did Clench & Abbott, who did not recognize the Oocorythidae as a distinct family but

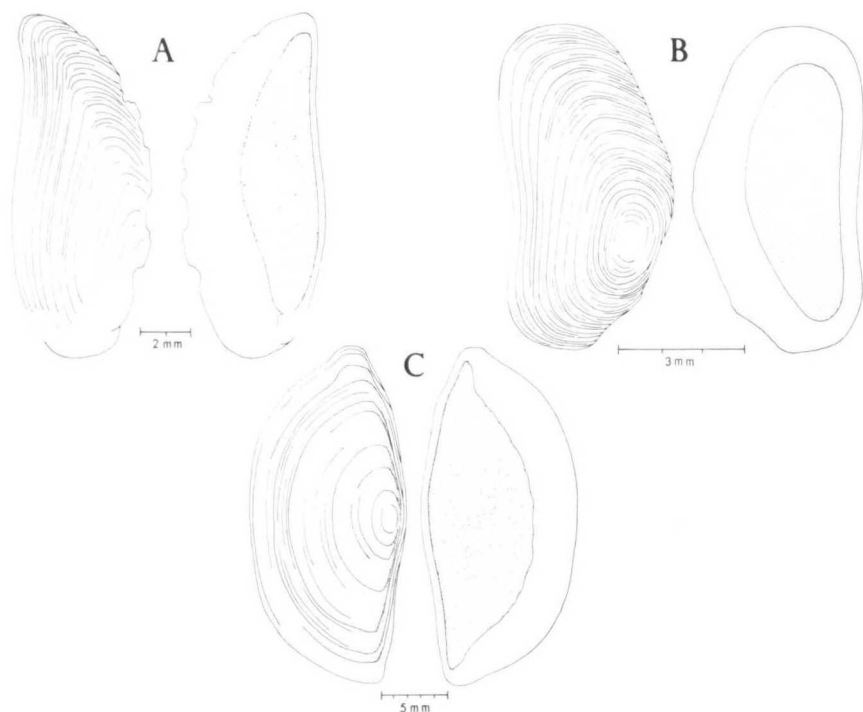


FIGURE 17. Cassidae. Opercula: A, *Sconsia striata* (Lam.), Sta. P-783; B, *Morum dennisoni* Reeve, Sta. P-916; C, *Bathygalea coronadoi* (Crosse), Sta. P-739. Drawings by Constance S. McSweeney.

ranked it as a subfamily of the Tonnidae. Olsson (1964:171) recognized the family Oöcoritidae (sic) and assigned *Dalium* to it. He reported the common occurrence of a late Neogene fossil *Dalium* much like *D. solidum* from the Esmeraldas Formation of Ecuador.

Material obtained by R/V PILLSBURY at several localities in the southern Caribbean Sea shows that the radula (Fig. 20, A) is virtually indistinguishable from that of *Oocorys* (Fig. 20, B, C), and that the operculum is weakly spiral with a terminal nucleus (Fig. 22, A), closer to that of *Oocorys* (Fig. 22, B) than to those of cassidids with central or lateral nucleus. Hence, the relationship originally deduced by Dall can be supported, even though the ultimate status of the Oocorythidae may remain open to discussion.

Type-Species.—*Dalium solidum* Dall, by original designation.

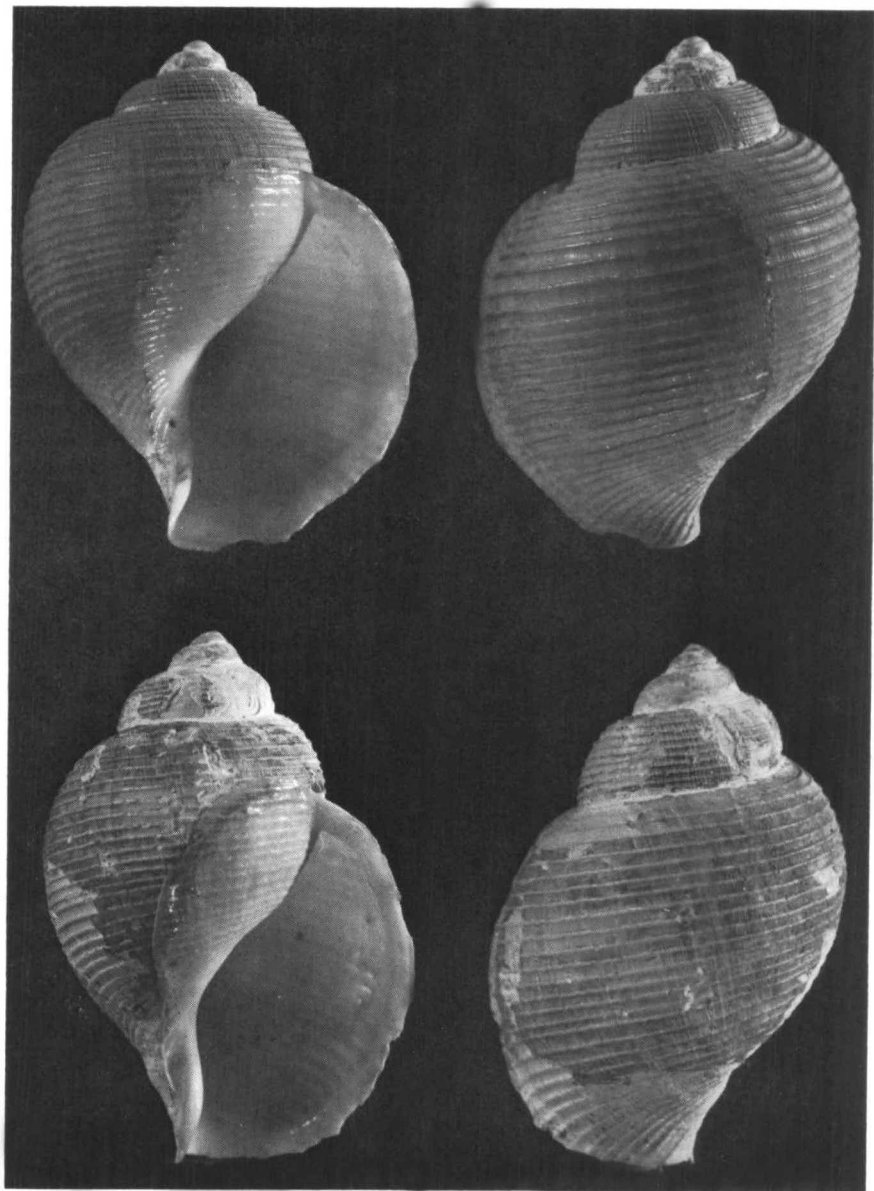


FIGURE 18. Oocorythidae. *Oocorys sulcata* Fischer: upper, Sta. P-681, western Atlantic, height 33.5 mm, width 26.8 mm; lower, Sta. P-18, eastern Atlantic, height 44.7 mm, width 33 mm.

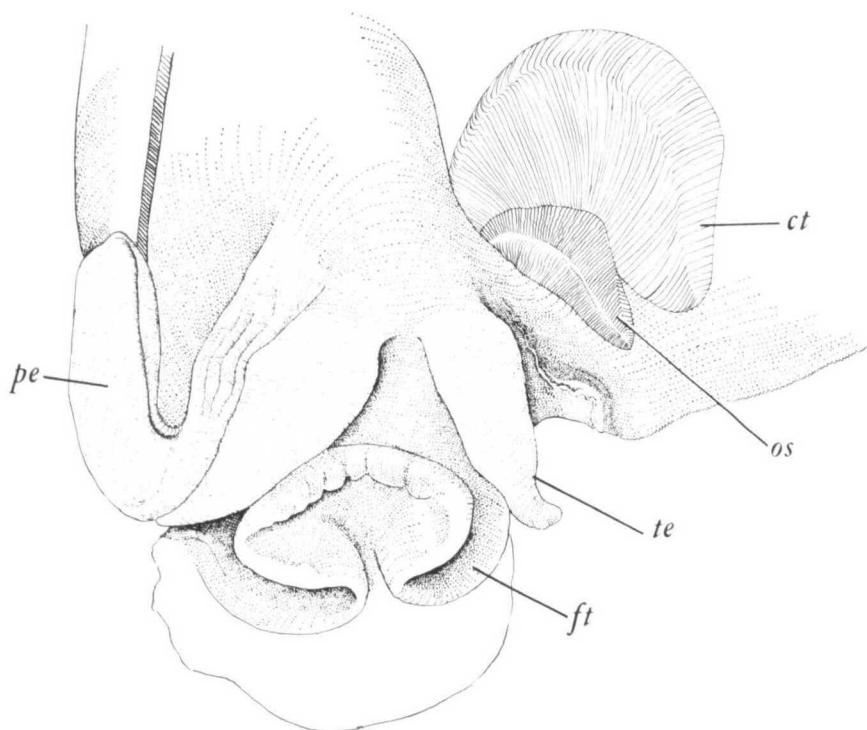


FIGURE 19. Oocorythidae. *Oocorys sulcata* Fischer, gross anatomy of mantle cavity of male from Sta. P-18. (ct, ctenidium; ft, foot; os, osphradium; pe, penis; te, tentacle.)

18. *Dalium solidum* Dall, 1889

Figs. 20, A; 21; 22, A

Dalium solidum Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 230, pl. 19, fig. 10d (off Grenada, Lesser Antilles, 576 fathoms, BLAKE Sta. 265).—Clench & Abbott, 1943, Johnsonia, 1(9): 8, pl. 4, figs. 6-7.

Material Examined.—Fifty-four specimens from the southern Caribbean off Panama, Colombia, Venezuela, and Surinam, at PILLSBURY Stas. P-381 (10°17.0'N, 75°59.9'W, 733-604 m; 1).—P-447 (9°07.4'N, 81°07.4'W, 664-681 m; 6).—P-448 (9°10.1'N, 80°55.6'W, 962-878 m; 2).—P-672 (07°37'N, 55°22'W, 1336-1221 m; 1).—P-682 (07°33.5'N, 56°25.0'W, 1318-1345 m; 2).—P-719 (11°35.0'N, 64°34.5'W, 1409-1629 m; 30).—P-747 (11°46.0'N, 67°05.7'W, 1175-1098 m; 1).—P-748 (11°24.8'N, 67°10.1'W, 1867-1784 m; 4).—P-754 (11°36.9'N, 68°42.0'W, 684-1574 m; 1).—P-770 (12°55.0'N, 71°46.5'W, 1318-1299 m; 6).

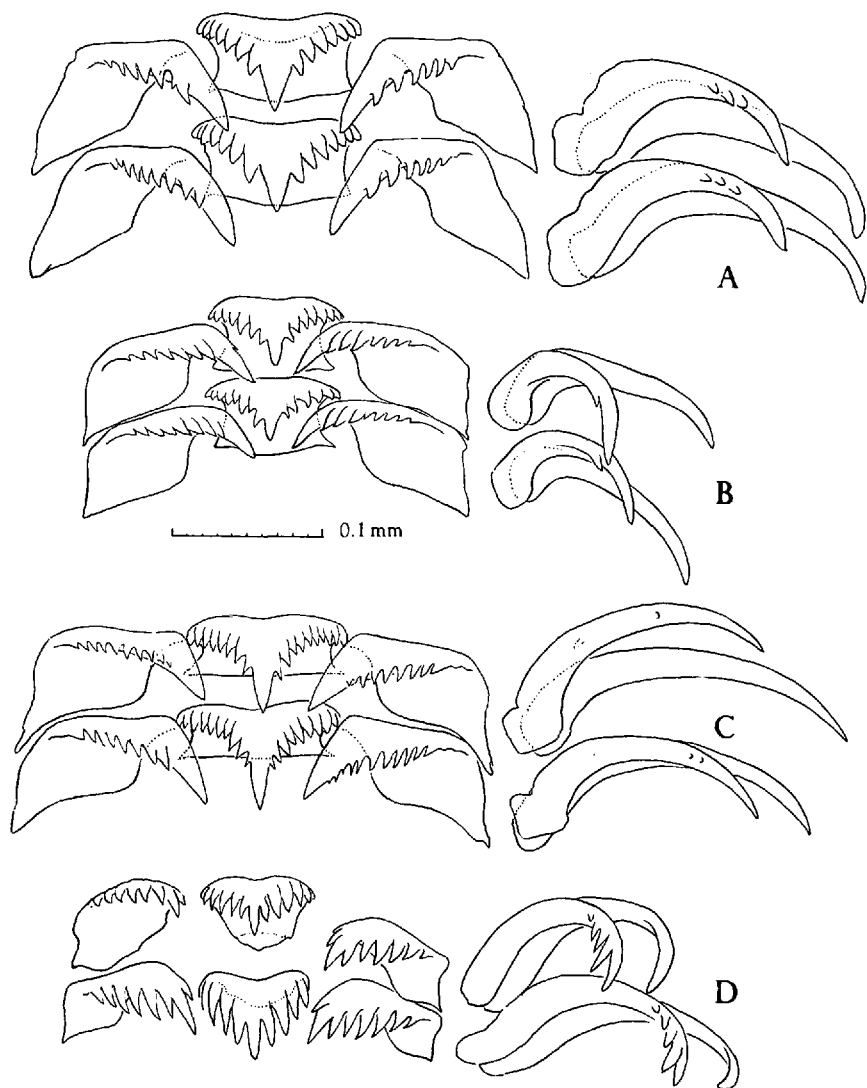


FIGURE 20. Radulae: A, *Dalium solidum* Dall, Sta. P-682.—B-C, *Oocorys sulcata* Fischer: B, Sta. P-681; C, Sta. P-18.—D, *Sconsia striata* (Lamarck), Sta. P-783. All figures drawn to same scale.

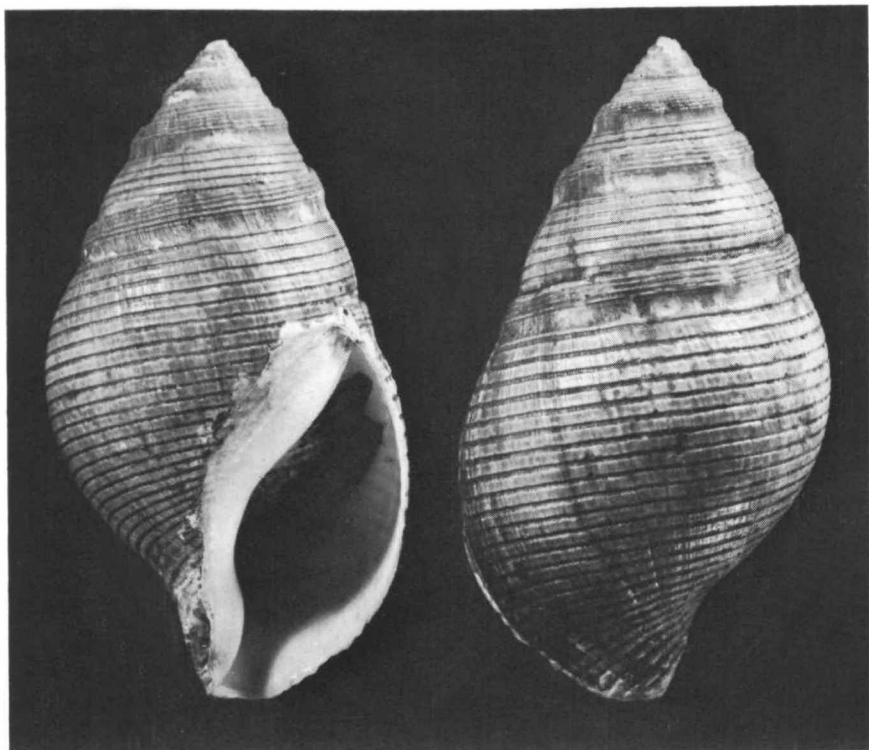


FIGURE 21. Oocorythidae. *Dalioides solidum* Dall, Sta. P-719, height 58.6 mm, width 33 mm.

Remarks.—It is noteworthy that all stations that yielded *D. solidum* reached depths exceeding 1000 meters, except those in the Gulf of Uraba (P-381, P-447, and P-448); all the specimens from the deepest station (P-748, 1784-1867 meters) were dead and badly damaged by erosion and breakage.

Dall's type-specimen measured 41.25 mm in length and 23.00 mm in width. The present material ranges from a length of 23.1 mm and breadth of 15.0 mm (P-447) to a length of 64.0 mm and a breadth of 37.1 mm (P-719).

Dall stated that the periostracum, "if any, is extremely thin," and Clench & Abbott (1943) after reexamining the same material concluded that there was "no periostracum apparent." In all of the present live-collected material, there is a thin, olivaceous periostracum worn smooth on top of the spiral cords but showing distinct, erect axial lamellae between them and everywhere in the region just behind the outer lip where abrasion has not

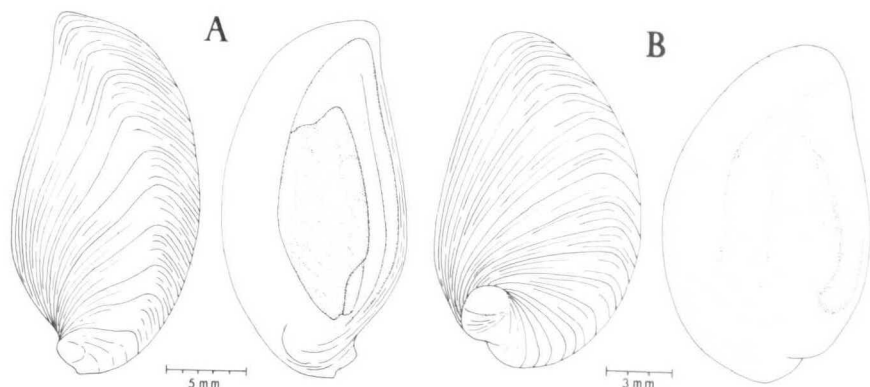


FIGURE 22. Opercula: A, *Dalium solidum*, Sta. P-682; B, *Oocorys sulcata*, P-681. Drawings by Constance S. McSweeney.

yet affected them. There is a tendency for the periostracum to be worn away in the subsutural channel, leaving a white spiral band ascending the spire. Beneath the periostracum, the shell is chalky white. The early whorls are generally much eroded, and even in the smallest specimens only the shelly filling of the nuclear whorls remains.

The operculum (Fig. 22, A) is ovate-trigonal, weakly spiral, with terminal nucleus, not so strongly spiral as that of *Oocorys* (Fig. 22, B) but not lateral as in *Phalium*, *Bathygalea* (Fig. 17, C), *Sconsia* (Fig. 17, A) and *Cassia*.

The radula of *Dalium* (Fig. 20, A) is essentially as in *Oocorys*; the marginal teeth are not so long and slender as in *Cassia* (see Thiele, 1929: 278, fig. 295a), and the inner marginal does not have the strong apical denticulation as in *Sconsia* (Fig. 20, D).

Family Ficidae

Genus *Ficus* Röding, 1798

Specimens of *Ficus* with shells spotted as in *F. howelli* Clench & Aguayo and *F. atlantica* Clench & Aguayo were taken by R/V PILLSBURY at five stations along the northern coast of South America, both inside and outside the Caribbean Sea, and on the southeastern coast of Hispaniola. Some of these have widely spaced reddish brown dots in six spiral rows as in *F. howelli*, whereas others have the spots more closely spaced in 9-12 spiral rows as in *F. atlantica*. The largest specimens are those with close spotting, the reverse of the situation with the original specimens described by Clench

& Aguayo (1940). Minor sculptural differences are present but do not appear to be correlated with color pattern.

Eleven living specimens were obtained, five males and six females. All males have six spiral rows of major spots (Fig. 23, A), two of them with some weaker intermediate spots in imperfect spirals. Five of the six females have nine or more spiral rows of dots (Fig. 23, C, D), but one has six only. The latter is a small example, 31.6 mm long. In one of the other female specimens it can be seen that the rows of dots increased rather abruptly from six to nine (Fig. 23, B). It appears that the spotting is similar in young shells of both sexes, becoming denser in females with the approach of maturity.

The curvature of the columella and the ventricosity of the shell also vary somewhat, but neither seems correlated with sex or color pattern. In the seven larger examples, presumably adults, the percentage of the diameter in the total length is 55, 56, 58, and 59 for the females, and 54, 59, and 59 for the males. Thus, both sexes have about the same range in ventricosity.

It seems clear that *Ficus howelli* Clench & Aguayo and *F. atlantica* Clench & Aguayo represent variations of a single species. The color pattern of their shells suggests that *F. howelli* is the male and *F. atlantica* the female. These nominal species are now united under the name:

19. *Ficus howelli* Clench & Aguayo

Figs. 23, 59

Ficus howelli Clench & Aguayo, 1940, Mem. Soc. Cub. Hist. nat., 14(1): 85, pl. 14, fig. 2.—Clench, 1945, Johnsonia, 1(18): 1, pl. 1, figs. 1-2 (off Bahía de Cochinos, Sta. Clara, Cuba, 175-225 fms = 315-405 m).

Ficus atlanticus Clench & Aguayo, 1940, Mem. Soc. Cub. Hist. nat., 14(1): 85, pl. 14, fig. 1.—Clench, 1945, Johnsonia, 1(18): 2, pl. 1, figs. 3-4 (off São Salvador, Brasil, 450 fms = 810 m).

Material Examined.—Ten specimens from five PILLSBURY stations, as follows: P-650, off French Guiana (06°07.0'N, 52°19.0'W, 84-91 m, 8 July 1968; 1 ♀).—P-728, Gulf of Cariaco, Venezuela (10°22.5'N, 65°23.0'W, 86 m, 21 July 1968; 2 ♀♀).—P-737, off Cabo Codera, Venezuela (10°44.0'N, 66°07.0'W, 60-73 m, 22 July 1968; 2 ♂♂).—P-838, off east coast of Trinidad (10°32.0'N, 60°23.0'W, 93-115 m, 30 June 1969; 2 ♂♂, 1 ♀).—P-1303, off SE coast of Hispaniola (18°21'N, 69°14.3'W, 172 m, 21 July 1970; 1 ♂, 2 ♀♀).

The largest specimen is a female with a shell 46.5 mm long, 26.7 mm wide (Sta. P-1303); the smallest specimen is a female with a shell 20 mm long, 11 mm wide (Sta. P-728); the largest male has a shell 39.3 mm long, 22.5 mm wide (Sta. P-838).

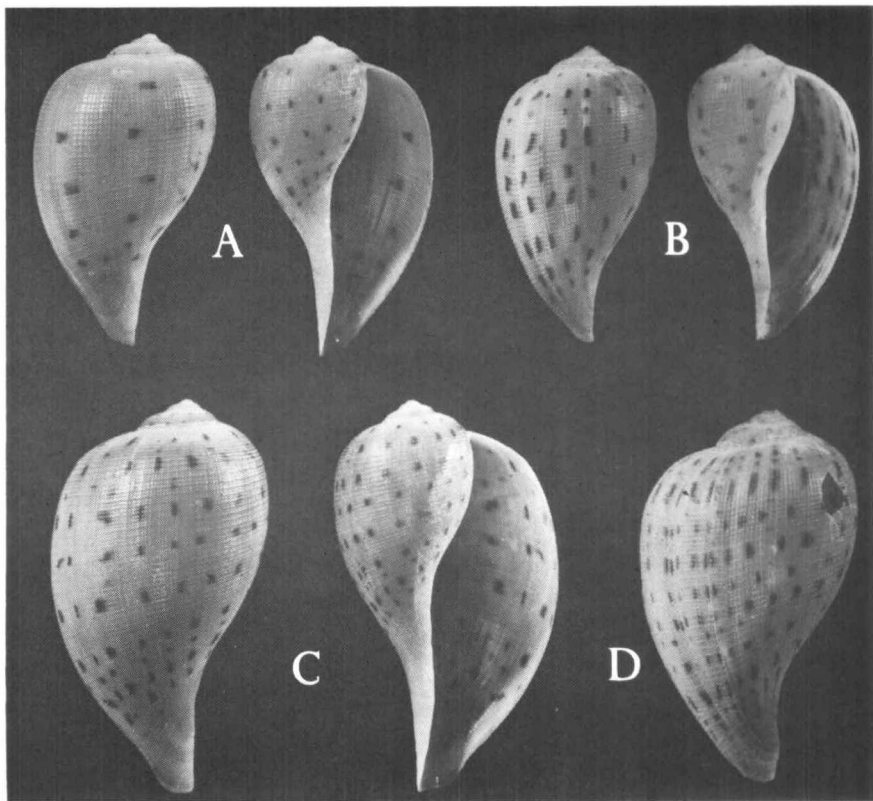


FIGURE 23. Ficidae. *Ficus howelli* Clench & Aguayo: A, male, Sta. P-1303, length 37.6 mm, width 22.2 mm; B, female, Sta. P-728, length 35.4 mm, width 20.5 mm; C, female, Sta. P-1303, length 46.5 mm, width 26.7 mm; D, female, Sta. P-650, length 44.8 mm, width 26.2 mm.

Diagnosis.—Shell pyriform, thin, rather small (maximal length probably not exceeding 50 mm), light yellowish brown in color with 6-12 spiral rows of small reddish brown dots, which are more widely spaced in males (Fig. 23, A) than in females (Fig. 23, B-D). Whorls about five when shell is fully grown, $4\frac{1}{2}$ to $4\frac{3}{4}$ in specimens approximately 35 mm in length. Sculpture closely cancellate, the spiral cords increasing in number by intercalation.

Remarks.—*Ficus pellucida* Deshayes (1856, Journ. Conchyl., 5: 184, pl. 6, figs. 1-2; "Sa patrie nous est inconnue") agrees in all respects except size—70 mm.

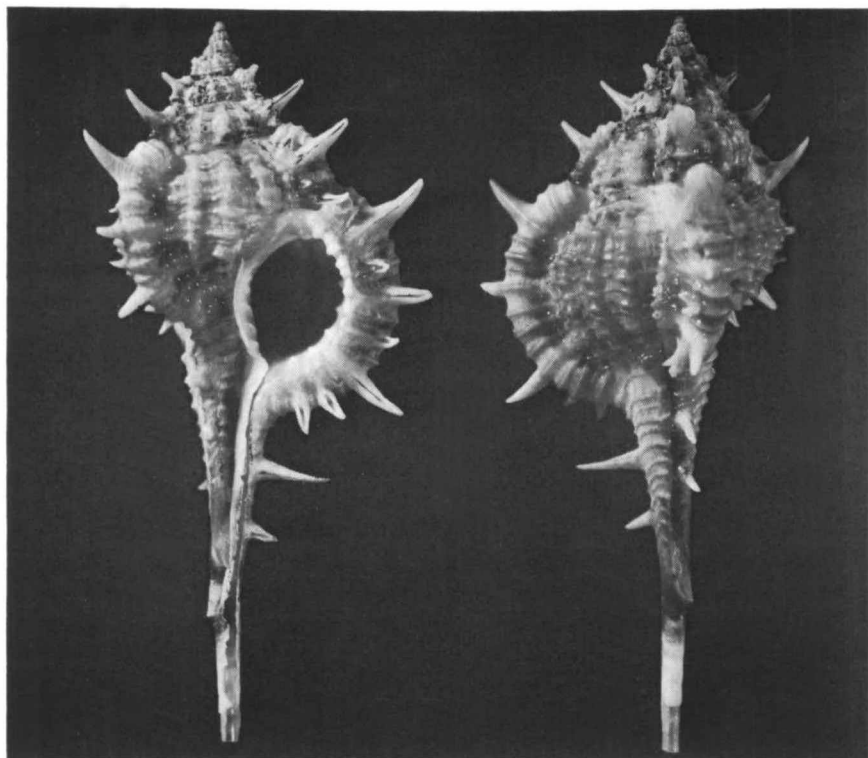


FIGURE 24. Muricidae. *Murex olssoni* Vokes, Sta. P-366, length 51 mm.

Family Muricidae

20. *Murex (Murex) olssoni* Vokes

Fig. 24

Murex (Murex) olssoni Vokes, 1967, Tulane Stud. Geol., 5(2): 84, pl. 3, figs. 1-3.

Description.—See Vokes, 1967.

Holotype.—USNM No. 677704.

Type-Locality.—Gulf of Morrosquillo, Colombia, OREGON Sta. 4896: 9°36'N, 75°52.5'W, 23-27 fathoms = 42-49 meters, 26 May 1964.

Records.—Taken at the following thirty stations of R/V PILLSBURY between Golfo de los Mosquitos, Panama, and Cartagena, Colombia, all in July, 1966: P-324 (9°44.0'N, 79°31.0'W, 64-55 m; 6).—P-330 (9°37.5'N, 78°54.0'W, 128-64 m; 1).—P-332 (9°31.2'N, 78°53.0'W, 51 m; 3).—

P-333 (9°33.0'N, 78°49.0'W, 57 m; 11).—P-334 (9°33.0'N, 78°50.0'W, 51 m; 3).—P-347 (8°43.0'N, 77°03.0'W, 55-53 m; 2).—P-362 (8°57.5'N, 76°33.6'W, 64-55 m; 8).—P-365 (9°31.1'N, 76°15.4'W, 56-58 m; 28).—P-366 (9°31.0'N, 75°59.5'W, 37-33 m; 7).—P-367 (9°31.1'N, 75°49.6'W, 37-35 m; 18).—P-368 (9°31.2'N, 75°41.1'W, 37 m; 7).—P-369 (9°35.7'N, 75°37.6'W, 18 m; 1).—P-370 (9°37.9'N, 75°50.4'W, 37 m; 8).—P-371 (9°40.0'N, 76°01.5'W, 46-55 m; 4).—P-379 (10°02.2'N, 75°41.3'W, 55 m; 1).—P-389 (9°53.8'N, 75°50.9'W, 70-51 m; 2).—P-392 (9°45.1'N, 76°09.1'W, 79-75 m; 2).—P-396 (9°18.2'N, 76°24.8'W, 70-68 m; 6).—P-397 (9°12.8'N, 76°27.1'W, 62-66 m; 5).—P-402 (8°51.2'N, 77°01.6'W, 73 m; 6).—P-403 (8°48.7'N, 77°12.7'W, 99-97 m; 1).—P-405 (8°49.2'N, 77°21.2'W, 92-93 m; 1).—P-411 (8°40.7'N, 77°21.8'W, 29-42 m; 4).—P-412 (8°38.9'N, 77°13.2'W, 55-60 m; 9).—P-425 (9°38.9'N, 79°15.3'W, 70-64 m; 4).—P-432 (9°18.2'N, 80°03.3'W, 24 m; 9).—P-433 (9°20.5'N, 80°13.5'W, 68-64 m; 1).—P-435 (9°08.5'N, 80°29.5'W, 37-48 m; 9).—P-437 (9°00.1'N, 80°45.8'W, 55 m; 16).—P-450 (9°22.0'N, 79°56.0'W, 9 m; 3).

Remarks.—It is interesting to note that this species, described as late as 1967, was found to be the commonest and most widespread shallow-water muricid along the coast of Panama and Colombia. A gap in its distribution, between Cabo de San Blas and Cabo Tiburon, may be more apparent than real, as the Continental Shelf there is so narrow and rough that sampling may not have been representative.

21. *Murex (Murex) donmoorei* Bullis

Fig. 25

Murex donmoorei Bullis, 1964, Tulane Stud. Zool., 11(4): 101, figs. 1-2.

Holotype.—USNM No. 635146.

Type-Locality.—45 miles north of St. Andrews Point, British Guiana; OREGON Sta. 2254: 7°07'N, 57°08'W, 20-22 fm (= 37-40 m).

Records.—Taken at 16 PILLSBURY stations between French Guiana and Paraguana Peninsula, Venezuela: P-648 (5°26'N, 52°12'W, 42 m, 8 July 1968; 6).—P-650 (6°07'N, 52°19'W, 84-91 m, 8 July 1968; 2).—P-653 (6°12'N, 52°58'W, 9 July 1968; 3).—P-669 (6°39'N, 55°15'W, 33 m, 10 July 1968; 4).—P-686 (7°00'N, 57°08'W, 27-26 m, 15 July 1968; 3).—P-695 (8°12'N, 58°33'W, 37 m; 15 July 1968; 1).—P-714 (11°29'N, 63°24.3'W, 59 m, 19 July 1968; 1).—P-718 (11°22.5'N, 64°08.6'W, 60 m, 20 July 1968; 4).—P-721 (11°06.5'N, 64°22.5'W, 26-27 m, 21 July 1968; 4).—P-723 (10°43.5'N, 64°16'W, 71-60 m, 21 July 1968; 1).—P-731 (10°20'N, 65°41'W, 57-60 m, 22 July 1968; 4).—P-749 (10°37'N, 67°57.9'W, 59 m, 25 July 1968; 1).—P-750 (10°36.1'N, 68°12.2'W, 22-

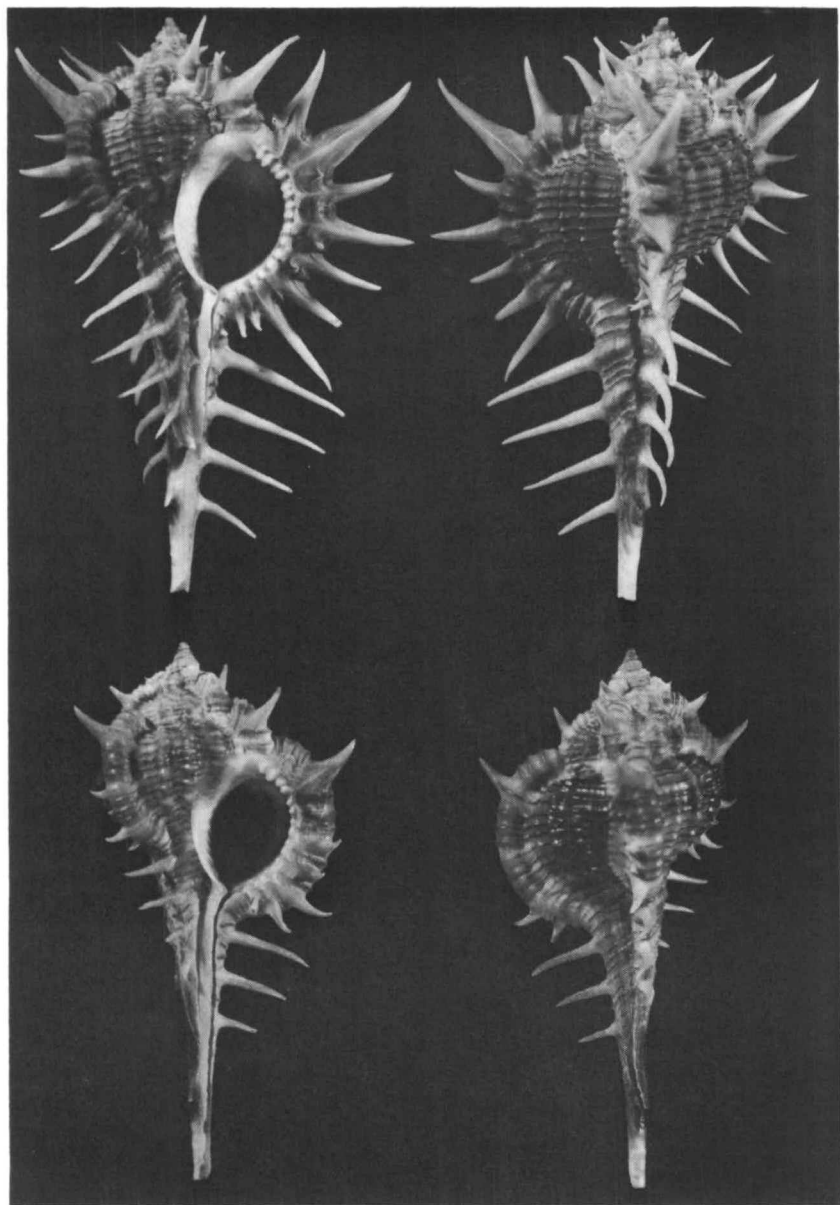


FIGURE 25. Muricidae. *Murex donmoorei* Bullis: upper, Sta. P-749, length 65.4 mm; lower, Sta. P-695, length 51.6 mm.

26 m; 25 July 1968; 15).—P-756 (11°33.1'N, 69°12.6'W, 16-38 m, 27 July 1968; 1).—P-758 (11°42.2'N, 69°40'W, 15-18 m, 27 July 1968; 1).—P-761 (11°52'N, 70°22'W, 35 m, 27 July 1968; 1).

Remarks.—As the present material conforms in essential details with the original description and with the type-specimens (holotype, USNM No. 635146; paratype, UMML 30-2770) that were available for comparison, the 16 lots enumerated above are referred to *M. donmoorei*. All have a large, carinate nucleus, a straight siphonal canal of only moderate length bearing three or four (rarely two) spines, the varices usually have six spines, and the spiral cords are marked by a brown line.

The specimens in the PILLSBURY collection vary in the intensity of coloration and the distinctness of the spiral lines, length of spines, length of anterior canal and, most significantly, in the presence or absence of a strong spine between the shoulder spine and the suture. Moreover, the holotype has this spine well developed (Bullis, 1964: figs. 1, 2), but the paratype (UMML 30-2770) lacks it, so it is possible that two species are involved in the type-series. However, pending a thorough investigation, all the specimens are retained under the name *donmoorei*.

The unusually elaborate specimen from Sta. P-749 shown in Figure 25 agrees with the holotype in the presence of the strong spine between shoulder and suture and is thus in best agreement with *Murex donmoorei*. All other specimens lack this spine as shown (Fig. 25), in agreement with the paratype, and therefore may eventually be referred to another species. They resemble *M. olssoni* Vokes in general appearance but in that species the nucleus is smaller and not carinate, the spire is higher, the spiral cords generally are not marked by brown lines, and the anterior canal usually has only one or two spines, rarely three.

22. *Murex (Murex) cabritii* Bernardi

Fig. 26

Murex cabritii Bernardi, 1858, Journ. Conchyl., 7: 301, pl. 10, fig. 3

Murex (Murex) cabritii, Clench & Pérez Farfante, 1945, Johnsonia, 1(17): 3, pl. 1 (synonymy).

Records.—This species has been taken at the following stations by R/V PILLSBURY: P-574, NE of C. Gracias a Dios, Nicaragua (16°16'N, 82°26.5'W, 37 m, 20 May 1967; 3).—P-615, Gulf of Honduras (16°01.5'N, 88°42.5'W, 13 m, 19 March 1968; 4).—P-616, Gulf of Honduras (16°01'N, 88°43'W, 13 m, 19 March 1968; 1).—P-623, off Cabo de Honduras: 16°00'N, 86°08'W, 42-55 m, 21 March 1968; 3).—P-625, off Cabo de Honduras (15°59.5'N, 86°02.5'W, 27-37 m, 21 March 1968; 5).—P-626, off Cabo de Honduras (15°57.6'N, 86°09'W, 35-40 m, 21 March 1968; 3).

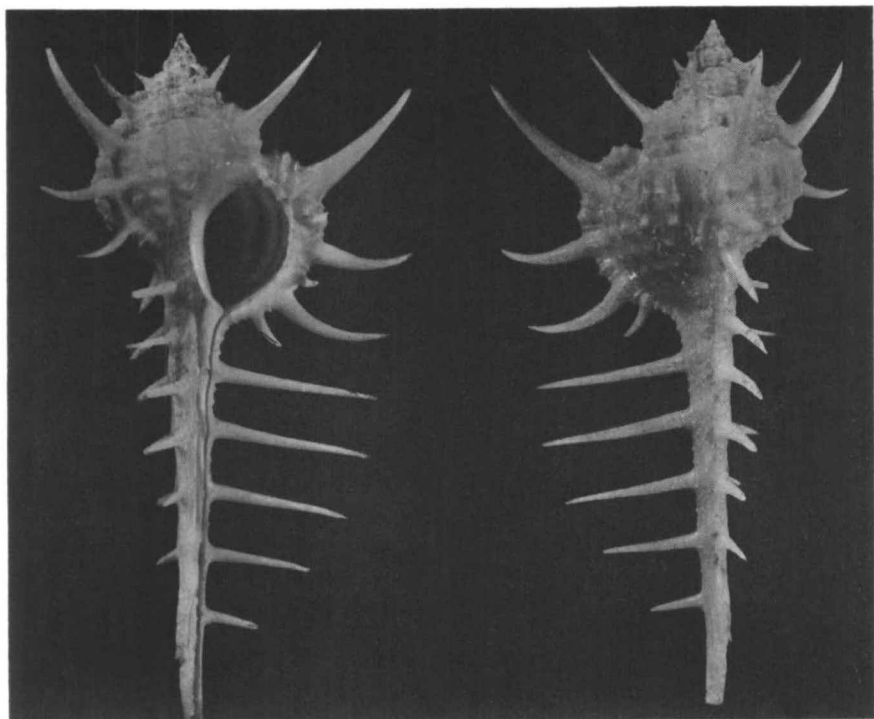


FIGURE 26. Muricidae. *Murex cabritii* Bernardi, Sta. P-615, length 61.7 mm.

—P-627, off Cabo de Honduras ($15^{\circ}56.5'N$, $86^{\circ}14.0'W$, 46 m, 21 March 1968; 3).

Remarks.—A photograph of a specimen from Sta. P-615 is given for comparison with *Murex donmoorei* Bullis (Fig. 25).

23. *Murex* (*Siratus*) *beauii* Fischer & Bernardi

Fig. 27

Murex beauii Fischer & Bernardi, 1857, Journ. Conchyl., 5: 295, pl. 3, fig. 1.

Murex (*Murex*) *beauii*, Clench & Pérez Farfante, 1945, Johnsonia, 1(17): 14, pl. 7.

Murex (*Murex*) *branchi* Clench, 1953, Johnsonia, 2(32): 360, pl. 179.

Murex (*Siratus*) *beauii*, Bullis, 1964, Tulane Stud. Zool., 11(4): 104.

Records.—This species has been taken at several stations in the Straits of Florida and Antilles by R/V GERDA and R/V PILLSBURY. Although the records will not be enumerated in detail at this time, the following are representative: GERDA Sta. G-1036, Straits of Florida SE of Marquesas

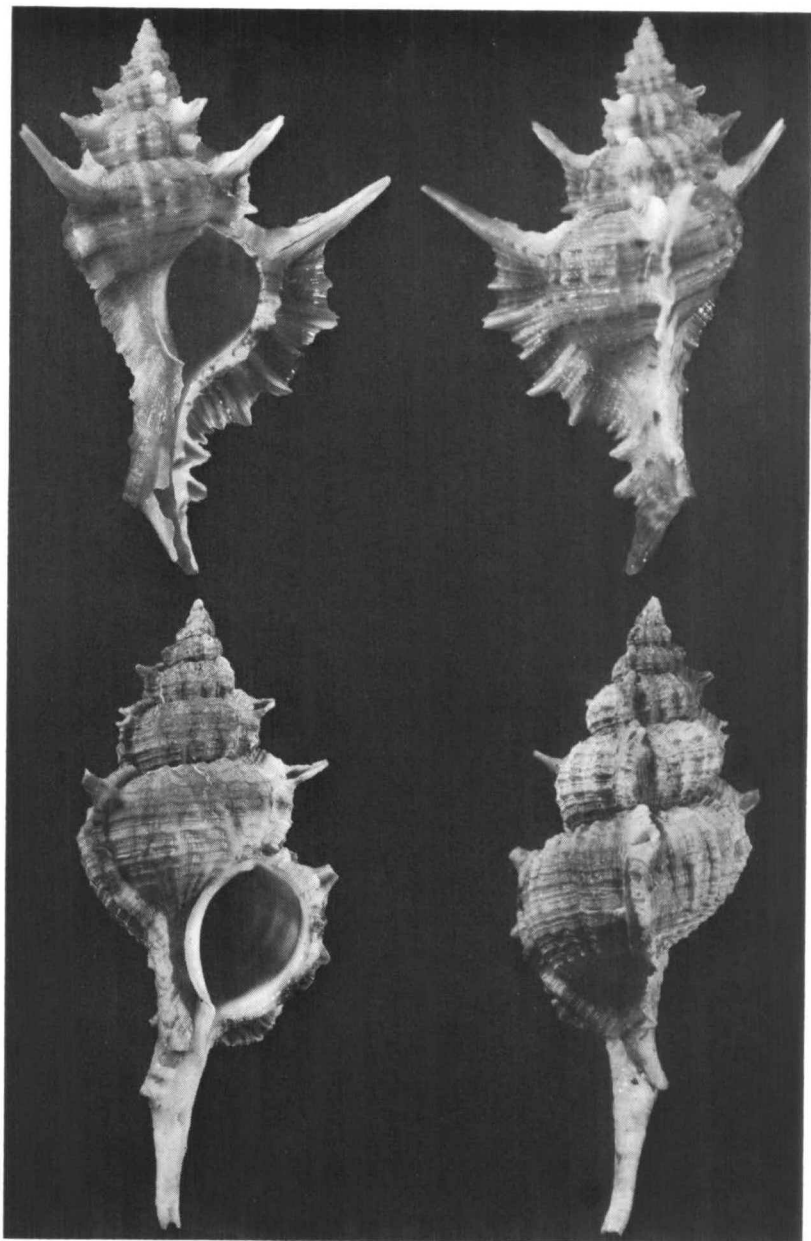


FIGURE 27. Muricidae. *Murex beauui* Fischer & Bernardi, Sta. P-876; upper, webbed form, length 49.5 mm; lower, "branchi" form, length 95.5 mm.

Keys (24°22.5'N, 80°53'W, 229-238 m, 26 February 1969; one specimen, *branchi* form).—GERDA Sta. G-1082, Straits of Florida SE of Sombrero Key (24°24.5'N, 82°02.5'W, 115 m, 26 April 1969; one specimen, *branchi* form).—PILLSBURY Sta. P-876, Lesser Antilles, off St. Vincent (13°13.9'N, 61°04.7'W, 231-258 m, 6 July 1969; five webbed specimens, one *branchi* form).—PILLSBURY Sta. P-943, Lesser Antilles, N of Guadeloupe (16°25.9'N, 61°36.7'W, 275 m, 17 July 1969; six webbed specimens).

Remarks.—As already suggested by Vokes (1963: 111), *Murex branchi* Clench is nothing but *M. beauui* without elaborate varical frills. The *branchi* form appears to be the usual form off the Florida Keys, but in the Antilles it occurs along with webbed examples. The specimens illustrated in Figure 27 are from the same haul (P-876).

24. *Murex (Chicoreus) brevifrons* Lamarck

Figs. 28, 29

Murex brevifrons Lamarck, 1822, Hist. Nat. Animaux sans Vertèbres, 7: 161.
Chicoreus (Chicoreus) brevifrons, E. Vokes, 1965, Tulane Stud. Geol., 3(4): 192, pl. 3, fig. 5 (synonymy).

Records.—Taken by R/V PILLSBURY at the following stations: P-648, French Guiana (05°26.0'N, 52°12.0'W, 41 m, 8 July 1968; 3 juv.).—P-650, French Guiana (06°07.0'N, 52°19.0'W, 83-91 m, 8 July 1968; 3 juv.).—P-655, French Guiana (06°07.0'N, 53°39.0'W, 25 m, 9 July 1968; 2 adults, 5 juv.).—P-663, Surinam (06°29.0'N, 54°41.0'W, 23 m, 10 July 1968, 1 juv.).—P-711, Venezuela (10°48.0'N, 63°13.0'W, 38-40 m, 19 July 1968; 3 adults).—P-721, Venezuela (11°06.5'N, 64°22.5'W, 25-27 m, 21 July 1968; 1 adult).—P-750, Venezuela (10°36.1'N, 68°12.2'W, 22-25 m, 25 July 1968; 2 juv.).—P-758, Venezuela (11°42.2'N, 69°40.0'W, 14-18 m, 27 July 1968; 2 adults).—P-761, Venezuela (11°52.0'N, 70°22.0'W, 34 m, 27 July 1968; 1 juv.).—P-772, Colombia (12°20.2'N, 71°55.1'W, 11 m, 29 July 1968; 1 juv.).

Remarks.—Some of the variations of *M. brevifrons* are so extreme that they hardly can be recognized as belonging to the species without comparison of intermediate forms. R/V PILLSBURY obtained such specimens at Sta. P-650, which can be linked by intergrades to the more usual growth form. The largest of these, which superficially resembles *M. argo* Clench & Pérez Farfante, is illustrated (Fig. 29), together with intermediate and typical forms (Fig. 28).

25. *Murex (Paziella) actinophorus* (Dall)

Figs. 30; 35, D

Trophon (Boreotrophon) actinophorus Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 206, pl. 15, fig. 2 (Dall's recognition of *Boreotrophon* at sub-

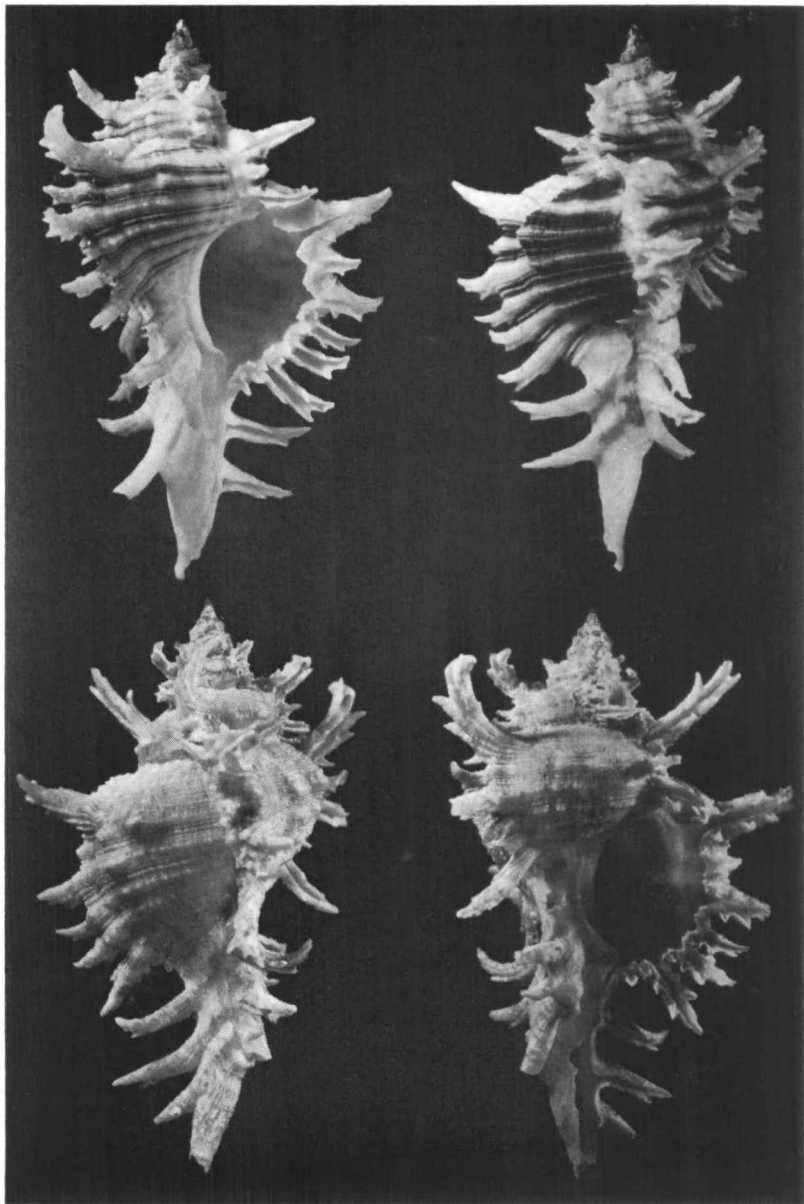


FIGURE 28. Muricidae. *Murex brevifrons* Lamarck; upper, Sta. P-721, length 102.2 mm; lower, Sta. P-655, length 79.4 mm.

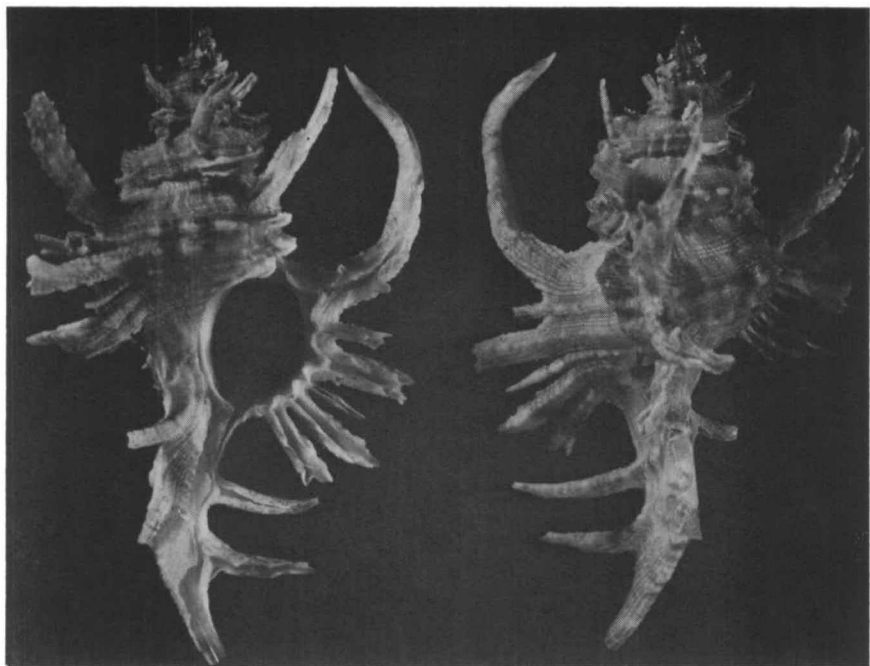


FIGURE 29. Muricidae. *Murex brevifrons* Lamarck, Sta. P-650, length 62.1 mm.

generic level is clearly indicated on p. 18 in the systematic list at the beginning of his paper); 1889b, Bull. U. S. natn. Mus., 37: 120, pl. 15, fig. 2 (name only; figure copied from 1889a).—M. Smith, 1939, Illustr. Catalogue Rock Shells: 19, pl. 9, fig. 3 (name only; figure copied from Dall). *Trophon actinophorus*, Bullis, 1964, Tulane Stud. Zool., 11(4): 107 (range extended to northern Brazil).

Description.—Dall, 1889a: 206.

Material Examined.—Twenty-eight specimens from the following stations of R/V GERDA and R/V PILLSBURY: G-524, Northwest Providence Channel (26°17'N, 78°41'W, 512-713 m, 3 March 1965; 1).—P-340, eastern Panama (9°13.5'N, 77°46'W, 307-366 m, 9 July 1966; 5).—P-394, off Golfo de Morrosquillo (9°28.6'N, 76°26.3'W, 421-641 m, 16 July 1966; 1).—P-445, Golfo de los Mosquitos (9°02.3'N, 81°23.8'W, 342-346 m, 21 July 1966; 2).—P-861, off the Grenadines (12°42'N, 61°05.5'W, 18-744 m, 4 July 1969; 1).—P-889, off St. Lucia (14°04.4'N, 60°50.8'W, 371-403 m, 7 July 1969; 1).—P-906, off Martinique (14°26.5'N, 60°59.2'W, 274-338 m, 9 July 1969; 1).—P-984, NW of Anguilla (18°26.4'N,

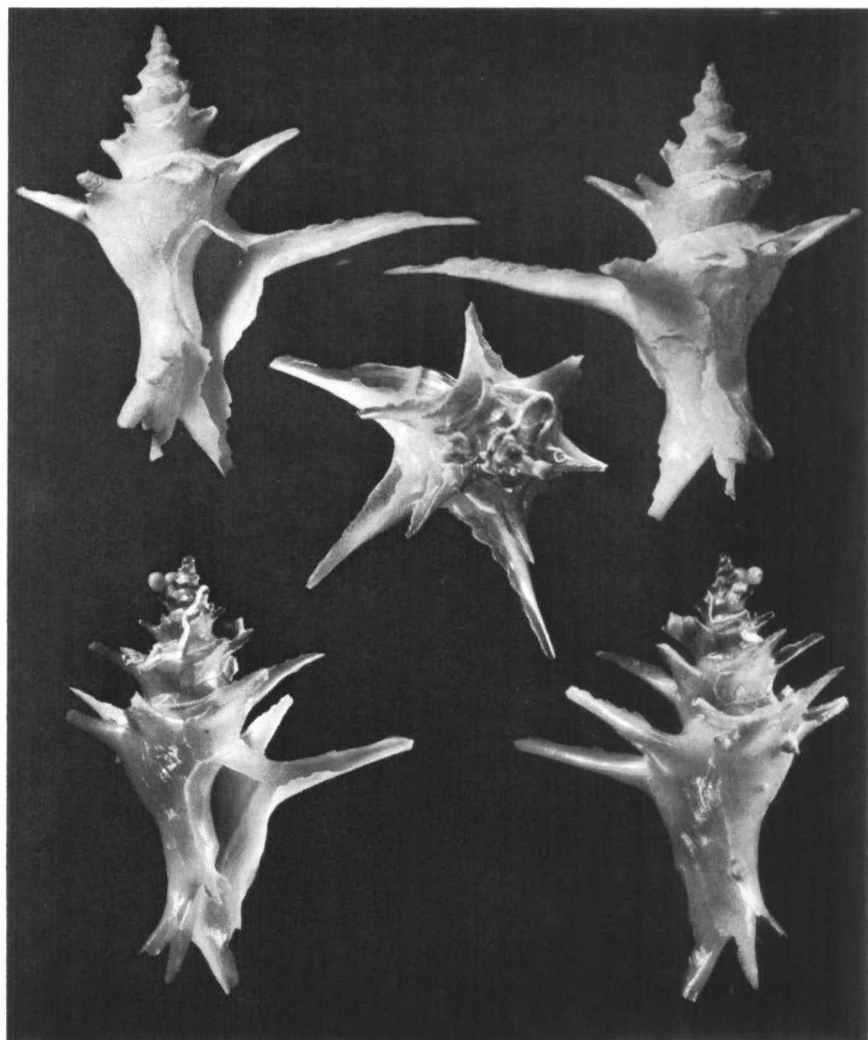


FIGURE 30. Muricidae. *Murex actinophorus* Dall, Sta. P-984: upper, two views of specimen 27.8 mm long; lower, three views of specimen 23.0 mm long.

63°12.6'W, 393-451 m, 22 July 1969; 2).—P-1225, south of Jamaica (17°42.5'N, 77°58'W, 549-530 m, 6 July 1970; 14).

Remarks.—Although the radula (Fig. 35, D) is similar to that of species of *Trophon*, it also resembles that of *Typhis* and, as in that genus, has an accessory semicircular chitinous jawlike structure that survives treatment



FIGURE 31. Muricidae. *Typhis longicornis* Dall, Sta. G-720, length 17.7 mm.

with KOH. Most significantly, the radula of "*Trophon*" *actinophorus* is almost indistinguishable from that of *Murex* (*Paziella*) *pazi* Crosse, which also has the jawlike structure as in *Typhis* but without a central cluster of denticles. As the shell of "*Trophon*" *actinophorus* is muricoid rather than trophonoid and, indeed, differs from *M.* (*Paziella*) *pazi* chiefly by the absence of spines around the base of the body whorl and by the thin outer lip which apparently does not develop denticles even in large examples, the species is here considered in the subgenus *Paziella*. The relationship of *Paziella* and *Poirieria* cannot be discussed at this time, but the two certainly are very close (see Vokes, 1964).

Originally described from BLAKE stations off St. Croix, Martinique, and Barbados, the range of this species was extended southward to the mouth of the Amazon River by Bullis (1964). The illustrated specimens from Sta. P-984, the larger of which is 27.8 mm in length, confirm Dall's suspicion that his specimen 17.5 mm in length was immature.

26. *Typhis* (*Siphonochelus*) *longicornis* Dall

Figs. 31; 34, A; 35, A; 36, B

Typhis longicornis Dall, in Agassiz, 1888, Bull. Mus. comp. Zool. Harv., 15 (2): 70, fig. 294; 1889b, Bull. U. S. natn. Mus., 37: 122, pl. 15, fig. 7; pl. 38, fig. 15 (listed only).

Typhis (Trubatsa) longicornis, Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 216, pl. 15, fig. 7; pl. 38, fig. 5.—Smith, 1939, Illustr. Cat. Rock Shells: 19, pl. 14, fig. 10 (photo of Dall's larger specimen).

Siphonochelus (Siphonochelus) longicornis, Keen, 1944, J. Paleont. 18(1): 58, 65.—Gertman, 1969, Tulane Stud. Geol., 7(4): 170.

Material Examined.—From GERDA stations G-524, Northwest Providence Channel (26°17'N, 78°41'W, 513-715 m, 3 March 1965; 2).—G-678, Northwest Providence Channel (25°57'N, 78°13'W, 540-576 m, 20 July 1965; 1).—G-720, W entrance of Northwest Providence Channel (26°22'N, 79°11'W, 476-500 m, 3 August 1965; 3).—G-721, W entrance to Northwest Providence Channel (26°23'N, 79°04'W, 494-487 m, 3 August 1965; 1).—G-722, W entrance to Northwest Providence Channel (26°15'N, 78°57'W, 393-392 m, 3 August 1965; 1).—G-935, N of Little Bahama Bank, 27°37'N, 78°52'W, 466-417 m, 30 September 1966; 1).—G-1008, Santaren Channel (24°03'N, 79°36'W, 540-576 m, 4 June 1968; 1).—G-1012, Santaren Channel (23°35'N, 79°33'W, 508-530 m, 14 June 1968; 1).—G-1015, Santaren Channel (23°34'N, 79°17'W, 525-516 m, 15 June 1968; 1).—G-1018 (24°07'N, 79°28'W, 546 m, 15 June 1968; 1).

PILLSBURY stations P-1225, south of Jamaica (17°42.5'N, 77°58'W, 549-530 m, 6 July 1970; 2).—P-1255, southwest of Jamaica (17°18'N, 78°32'W, 805-722 m, 14 July 1970; 1).

Remarks.—The specimens taken at the 12 stations listed above clearly represent Dall's species, although they are mostly not quite so slender as the types. A good size-range is represented, but all the present specimens are white; the larger ones do not have areas of pale rosy brown as reported by Dall. Moreover, according to Dall's description, the varices are "not fimbriated, with rounded edges," but the holotype (USNM No. 94780) and two paratypes (No. 94781) clearly show the broken edge of a thin varical expansion. In all specimens taken by R/V PILLSBURY and R/V GERDA, there also is clear indication of a thin, capelike expansion from the rounded varices. This expansion, especially on the penultimate and earlier varices, is more or less broken in all specimens. In those that evidently have been in resting condition for some time, it is broken away completely even on the final varix, but it leaves a scar which, once recognized, is clearly distinguishable. In the most nearly perfect specimens, this varical expansion is conspicuous and forms a projection in front of the tube which corresponds to the varical spine of *Siphonochelus (Laevityphis) bullisi* Gertman. Therefore, the tube is separate from the true varix in *T. longicornis* as it is in *S. bullisi*. Accordingly, the distinction between *Siphonochelus* s.s. and *Laevityphis* Cossmann seems to have insufficient justification.

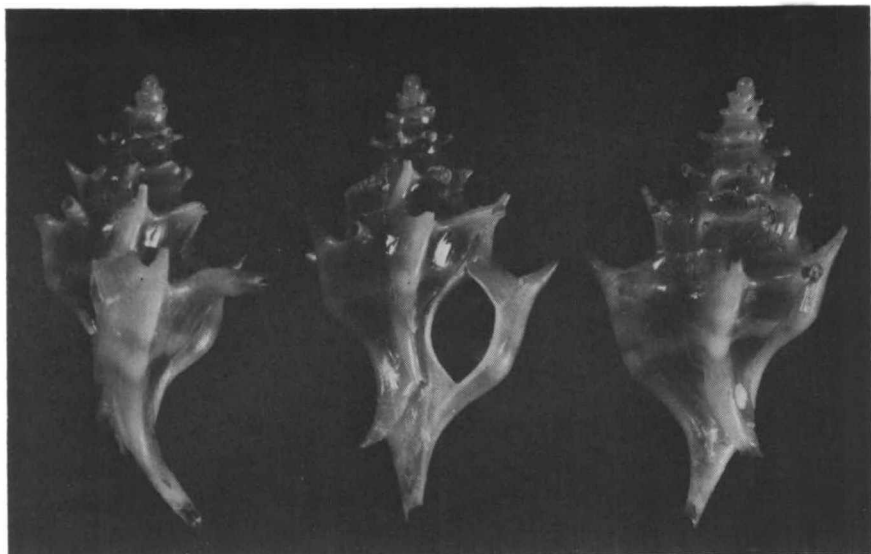


FIGURE 32. Muricidae. *Typhis bullisi* Gertman, Sta. P-379, length 11.4 mm.

27. *Typhis* (*Siphonochelus*) *bullisi* (Gertman)

Figs. 32; 34, B; 35, C; 36, C

Siphonochelus (*Laevityphis*) *bullisi* Gertman, 1969, Tulane Stud. Geol., 7 (4): 178, pl. 7, figs. 3a, 3b.

Description.—Gertman, 1969.

Holotype.—U. S. National Museum, No. 696660.

Type-Locality.—OREGON Sta. 5727, southwestern Caribbean Sea, W of Cabo Tiburon, Panama, 8°47'N, 77°09'W, 79 meters, October 17, 1965.

Records.—Seventy-four specimens from 15 stations of R/V PILLSBURY: P-347, Gulf of Uraba (8°43.0'N, 77°03.0'W, 55-53 m, 11 July 1966; 4).—P-361, Colombia (8°51.9'N, 76°37.2'W, 37 m, 12 July 1966; 1).—P-366, Colombia (9°31.0'N, 75°59.5'W, 37-33 m, 13 July 1966; 1).—P-367, Colombia (9°31.1'N, 75°49.6'W, 37-35 m, 13 July 1966; 3).—P-368, Colombia (9°31.2'N, 75°41.1'W, 37 m, 13 July 1966; 21).—P-369, Colombia (9°35.7'N, 75°37.6'W, 18 m, 13 July 1966; 8).—P-370, Colombia (9°37.9'N, 75°50.4'W, 37 m, 13 July 1966; 9).—P-378, Colombia (9°54.6'N, 75°42.4'W, 51-59 m, 14 July 1966; 3).—P-379, Colombia (10°02.2'N, 75°41.3'W, 55 m, 14 July 1966; 1).—P-380, Colombia (10°06.5'N, 75°48.1'W, 64-70 m, 14 July 1966, 1).—P-396, Colombia (9°18.2'N, 76°24.8'W, 70-68 m, 17 July 1966; 2).—P-398, Colombia (9°05.6'N,

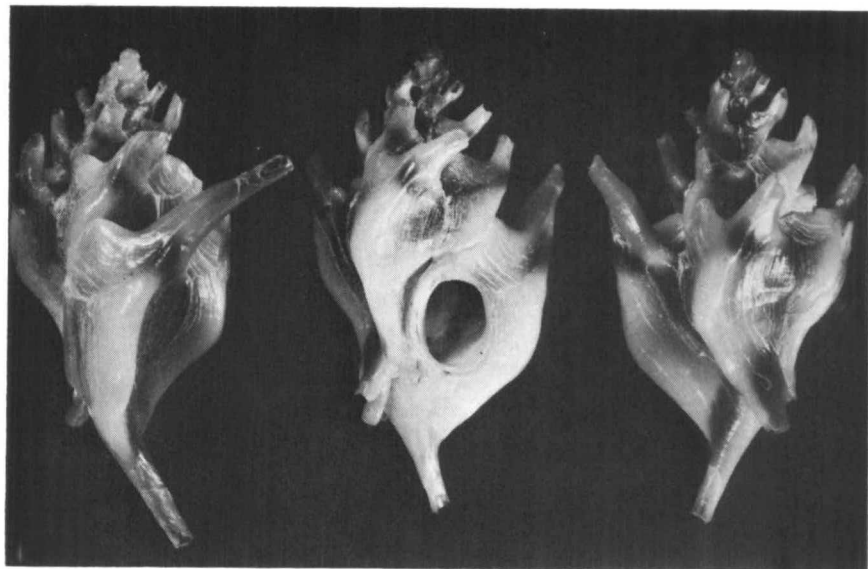


FIGURE 33. Muricidae. *Typhis tityrus*, n. sp., holotype, Sta. P-718, length 11.9 mm.

76°32.1'W, 175-117 m, 17 July 1966; 1).—P-400, Colombia (8°52.4'N, 76°50.4'W, 92-99 m, 17 July 1966; 7).—P-402, Colombia (8°51.2'N, 77°01.6'W, 73 m, 17 July 1966; 7).—P-796, Colombia (10°20.7'N, 75°39.1'W, 60-66 m, 1 August 1968; 5).

Remarks.—These records show *T. bullisi* to be locally abundant in the vicinity of the Gulf of Uraba at depths from 18 to 117 meters.

Although the varical spine is hollow in *T. bullisi* (as Dall noted in *T. linguiferus* also), its lumen does not communicate with the interior of the shell after the spine is fully developed.

28. *Typhis* (*Siphonochelus*) *tityrus* n. sp.

Figs. 33; 34, C

Description.—Shell small, composed of $1\frac{1}{2}$ bulbous nuclear whorls followed by five postnuclear whorls. Color rusty brown or pink, the varices white except for a patch of color at the base of the tubes. Interior of aperture flushed with pink. Four smooth, thick, somewhat reflected varices per whorl, without any trace of varical expansion, extending upward to meet the corresponding varix of the preceding whorl. Tubes directed apically, strongly recurved, forming a stout, tapered, hollow spine incorporated in the shoulder of each varix; tips of tubes delicate, glassy, more or less broken

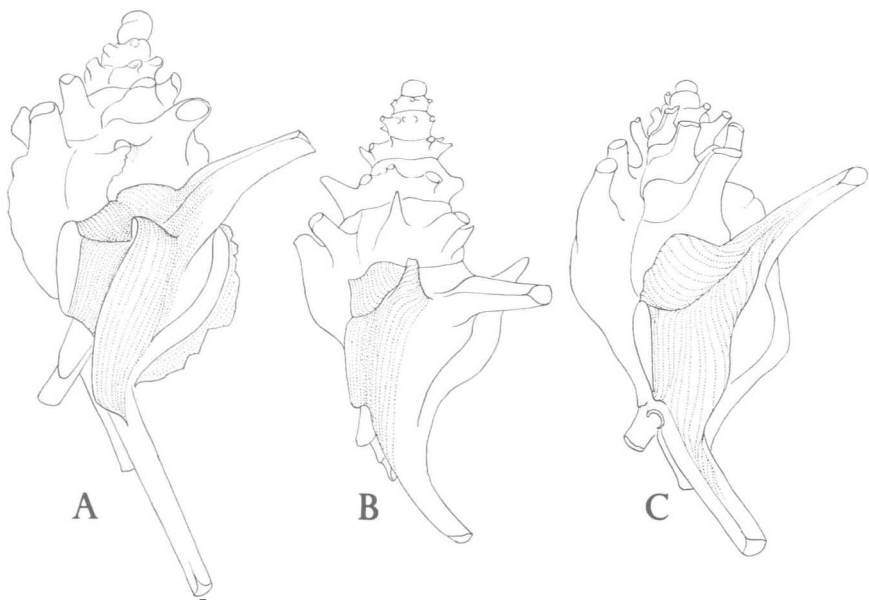


FIGURE 34. Profiles of aperture and final varix: A, *Typhis longicornis* Dall, Sta. G-720; B, *Typhis bullisi* Gertman, Sta. P-379; C, *Typhis tityrus*, n. sp., Sta. P-718.

in all specimens; bases of tubes extended into a thick spiral ridge at the shoulder of the whorls. Suture distinct, impressed. Final varix forming a broad outer lip of nearly uniform width, obtusely angled at the base of the body whorl. Aperture subcircular, its protruding rim externally sculptured with strong growth lines and internally forming three blunt denticles within the palatal margin of old specimens (obscure or absent in younger shells). Anterior canal closed, straight, basally tapered, deflected to the right and abaperturally, long and terminally very delicate and therefore broken to some extent. Surface glossy, with faint, raised spiral lines on the body whorl below the shoulder; incised lines of growth distinct.

Operculum broadly oval, with apical nucleus and strongly raised lamellar lines of growth. Radula not obtained.

Measurements.—Holotype, Sta. P-718: length, 11.9 mm (anterior canal broken), width 6.2 mm.

Holotype.—USNM, No. 700005.

Type-Locality.—Off Isla Margarita, Venezuela, 11°22.5'N, 64°08.6'W, 60 meters, PILLSBURY Sta. P-718, 20 July 1968.

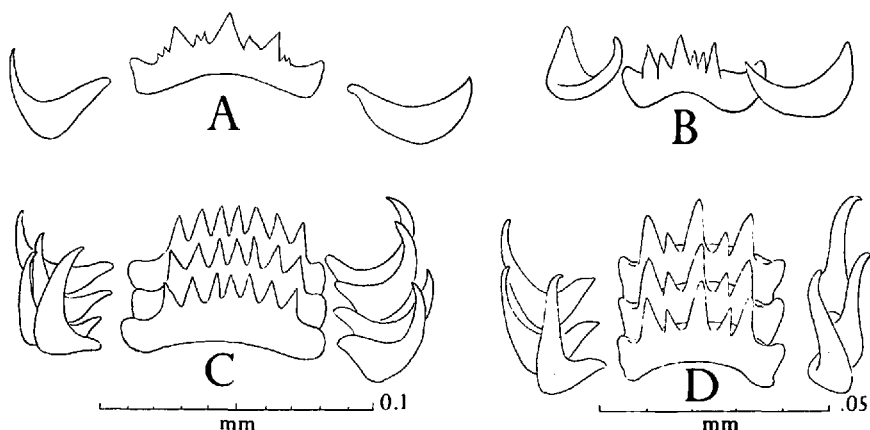


FIGURE 35. Radulae: A, *Typhis longicornis* Dall; B, *Typhis expansus* Sowerby; C, *Typhis bullisi* Gertman; D, *Murex actinophorus* Dall. The 0.1-mm scale applies to A-C; the 0.5-mm scale applies only to D.

Paratypes.—In addition to the holotype, the type-series contains paratypes from the following stations: P-718, type-locality (11°22.5'N, 64°08.6'W, 60 m, 20 July 1968, 1 sp., 8.3 mm × 6.2 mm).—P-727, Gulf of Cariaco (10°20'N, 65°02'W, 64 m, 21 July 1968, 1 sp., 9 mm × 5.2 mm).—P-757, off Pen. de Paraguana (11°39.6'N, 69°22.1'W, 161-187 m, 27 July 1968, 2 sp., 10 mm × 6.5 mm, 9.5 mm × 5 mm).—P-848, N of Trinidad (11°22.0'N, 61°26.4'W, 146 m, 2 July 1969, 1 sp., 13.6 mm × 5 mm).

Remarks.—This small shell bears a strong resemblance to the unique *T. cercadicus* Maury as described by Gertman (1969: 168), but in that species the varices end at the shoulder whereas in the present species they form partitions extending between the shoulder and the suture where they are cemented to the varices of the preceding whorl. In *T. cercadicus* the outer lip narrows above the aperture, whereas in the present form it is somewhat wider.

29. *Typhis (Talityphis) expansus* Sowerby

Fig. 37, A-C

Typhis expansus Sowerby, 1874, Proc. Zool. Soc. Lond. (for 1873): 719, pl. 59, fig. 4.

Typhis (Talityphis) expansus, Gertman, 1969, Tulane Stud. Geol., 7(4): 167, pl. 5, figs. 5a, b; 6a, b (synonymy; designates Paramaribo, Surinam, as type-locality).

Description.—Gertman, 1969: 167.



FIGURE 36. Jaws: A, *Typhis expansus* Sowerby; B, *Typhis longicornis* Dall; C, *Typhis bullisi* Gertman.

Material Examined.—Material from the following stations shows definitive formation of the outer lip: P-332, off Punta San Blas ($9^{\circ}31.2'N$, $78^{\circ}53'W$, 51 m, 8 July 1966; 2).—P-333, Golfo de San Blas ($9^{\circ}33'N$, $78^{\circ}49'W$, 57 m, 8 July 1966; 1).—P-365, Golfo de Morrosquillo ($9^{\circ}31.3'N$, $76^{\circ}15.4'W$, 56-58 m, 13 July 1966; 5).—P-402, Golfo de Uraba ($8^{\circ}51.2'N$, $77^{\circ}01.6'W$, 73 m, 17 July 1966; 1).—P-574, off Cabo Gracias a Dios ($16^{\circ}16'N$, $82^{\circ}26.5'W$, 37 m, 20 May 1967; 1).—P-648, off French Guiana ($5^{\circ}26'N$, $52^{\circ}12'W$, 42 m, 8 July 1968; 3).—P-669, off Surinam ($6^{\circ}39'N$, $55^{\circ}15'W$, 33 m, 10 July 1968; 1).—P-684, off Surinam ($7^{\circ}19'N$, $56^{\circ}51'W$, 55-59 m, 14 July 1968; 1).—P-686, off Surinam ($7^{\circ}00'N$, $57^{\circ}08'W$, 27-26 m, 15 July 1968; 5).—P-687, off Guyana ($7^{\circ}13'N$, $57^{\circ}36'W$, 27 m, 15 July 1968; 2).—P-699, off Venezuela ($9^{\circ}30'N$, $60^{\circ}15'W$, 64 m, 16 July 1968; 1).—P-714, off Margarita I., Venezuela ($11^{\circ}29'N$, $64^{\circ}24.3'W$, 59 m, 20 July 1968; 1).—P-721, off Margarita I., Venezuela ($11^{\circ}06.5'N$, $64^{\circ}22.5'W$, 26-27 m, 21 July 1968; 3).—P-727, Gulf of Cariaco ($10^{\circ}20'N$, $65^{\circ}02'W$, 64 m, 21 July 1968; 2).—P-731, Gulf of Cariaco ($10^{\circ}20'N$, $65^{\circ}41'W$, 57-60 m, 22 July 1968; 2).—P-766, off Gulf of Venezuela ($12^{\circ}14.3'N$, $70^{\circ}40'W$, 64 m, 28 July 1968; 3).—P-835, off Trinidad ($9^{\circ}36'N$, $60^{\circ}10'W$, 48 m, 30 June 1969; 3).

Specimens from the following stations lack the widely expanded, definitive outer lip: P-324, off Punta Manzanillo ($9^{\circ}44'N$, $79^{\circ}31'W$, 64-55 m, 7 July 1966; 1).—P-435, Golfo de los Mosquitos ($9^{\circ}08.5'N$, $80^{\circ}29.5'W$,

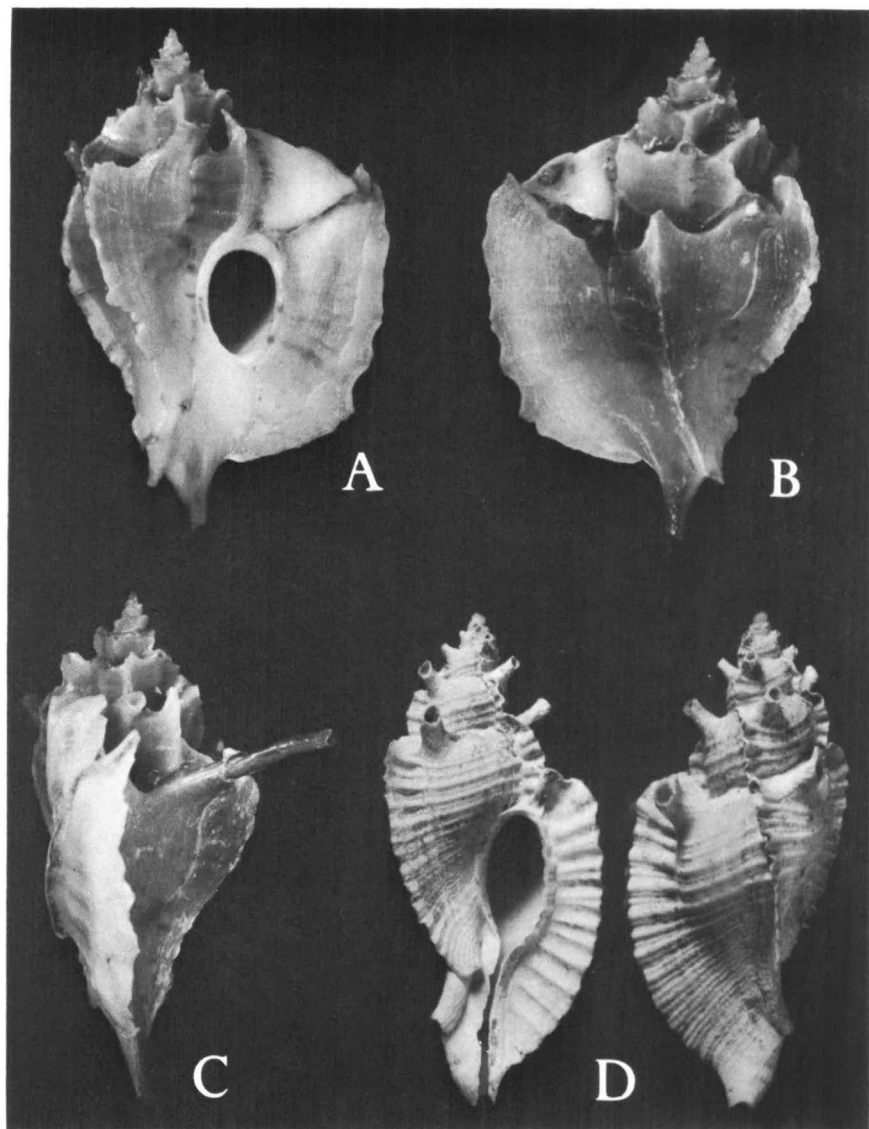


FIGURE 37. Muricidae. A-C, *Typhis expansus* Sowerby; Sta. P-699, length 30.5 mm; D, *Typhis pinnatus* Broderip, Sta. P-368, length 13.5 mm.

37-48 m, 20 July 1966; 1).—P-444, Golfo de los Mosquitos (8°57.5'N, 81°31'W, 73 m, 21 July 1966; 1).—P-619, off Cabo de Honduras (15°58.2'N, 87°34'W, 18-64 m, 20 March 1968; 1).—P-695, off Guyana (8°12'N, 58°33'W, 37 m, 15 July 1968; 1).—P-842, off Tobago (11°10.6'N, 60°31.2'W, 68-73 m, 1 July 1969; 2).

Remarks.—The fully developed specimens agree satisfactorily with the description and figures given by Gertman (1969) and no doubt represent Sowerby's species, although they vary greatly in size. Specimens without the expanded lip have a very different aspect and could be taken for a different species. However, individuals showing the formative stage of the definitive lip demonstrate that these forms are merely an ontogenetic stage of *T. expansus*.

30. *Typhis (Pterotyphis) pinnatus* (Broderip)

Fig. 37, D

Typhis pinnatus Broderip, 1833, Proc. Zool. Soc. Lond., Part 2: 178.

Typhis fordi Pillsbury, 1943, Nautilus, 57: 40, pl. 7, fig. 4.

Pterotyphis (Pterotyphis) pinnatus, Gertman, 1969, Tulane Stud. Geol., 7 (4): 183, pl. 8, figs. 2a, 2b.

Description.—Gertman, 1969.

Record.—PILLSBURY Sta. P-368, Golfo de Morrosquillo, Colombia: 9°31.2'N, 75°41.1'W, 37 meters, 13 July 1966; one specimen.

Remarks.—First reported from Panama by Gertman (1969), this species is now recorded from Colombia.

Family Columbariidae

Genus *Columbarium* von Martens, 1881

Columbarium von Martens, 1881, Conchologische Mittheilungen, 2: 105.—Thiele, 1929, Handb. Syst. Weichtierkunde, 1: 289.—Clench, 1944, Johnsonia, 1(15): 1.—Darragh, 1969, Proc. R. Soc. Vict., 83: 71.

Diagnosis.—See Thiele, 1929; Clench, 1944; Darragh, 1969.

Type-Species.—*Pleurotoma (Columbarium) spinicincta* von Martens by original designation (see Darragh, 1969:71).

Remarks.—Until the present time, five species of this genus have been reported in the Western Atlantic: *C. sarissophorum* (Watson, 1882), *C. atlantis* Clench & Aguayo, 1938; *C. bartletti* Clench & Aguayo, 1940; *C. bermudezi* Clench & Aguayo, 1938; and *C. brayi* Clench, 1959. All of these species agree in the elongate, fusiform shape of the shell and distinctly carinated whorls, and, insofar as known (*bermudezi* and *brayi*), have radular characters very close to those reported for the genus (see Peile, 1922: 14, fig. 1; Thiele, 1929: 289, fig. 311). Examination of several

small, fusiform gastropods taken in the Straits of Florida revealed nuclear and early postnuclear whorls nearly identical with those of *C. bermudezi*. Study of the radulae of these specimens showed dentition virtually indistinguishable from that of *C. bermudezi* and *C. brayi*. Although none of the shells is strongly carinate, in two the shoulder is angled in all the post-nuclear whorls and in the other two it is angled in the early post nuclear whorls but not the later ones. The development of low, curved axial ribs crossed by more or less distinct spiral cords results in a fusinid appearance. Only the radular characters and the appearance of the early whorls show these forms to be distinct from *Fusinus*.

Clench, in 1944, reiterated the prediction that several small species originally described in the genus *Fusus* will prove to belong to *Columbarium* when the type-specimens are reexamined. However, none of the western Atlantic species included in the genus *Fusinus* seem referable to *Columbarium*, even the small forms described by Dall.

Darragh (1969) revised the family and considered its paleontological history. He recognized six genera, one of which he established for a western Atlantic species. As the radular characters are so uniform throughout and the differences in protoconch and adult shell are not great, these taxa are here treated at subgeneric level. Since the three new species here described do not fit any of these taxa well, a new subgenus is proposed for them.

31. *Columbarium (Histricosceptrum) bartletti* Clench & Aguayo
Fig. 38, A

Columbarium bartletti Clench & Aguayo, 1940, Mem. Soc. Cub. Hist. nat., 14: 86, pl. 14, fig. 3.—Clench, 1944, *Johnsonia*, 1(15): 3, pl. 1, fig. 5.
Histricosceptrum bartletti Darragh, 1969, Proc. R. Soc. Vict., 83: 88.

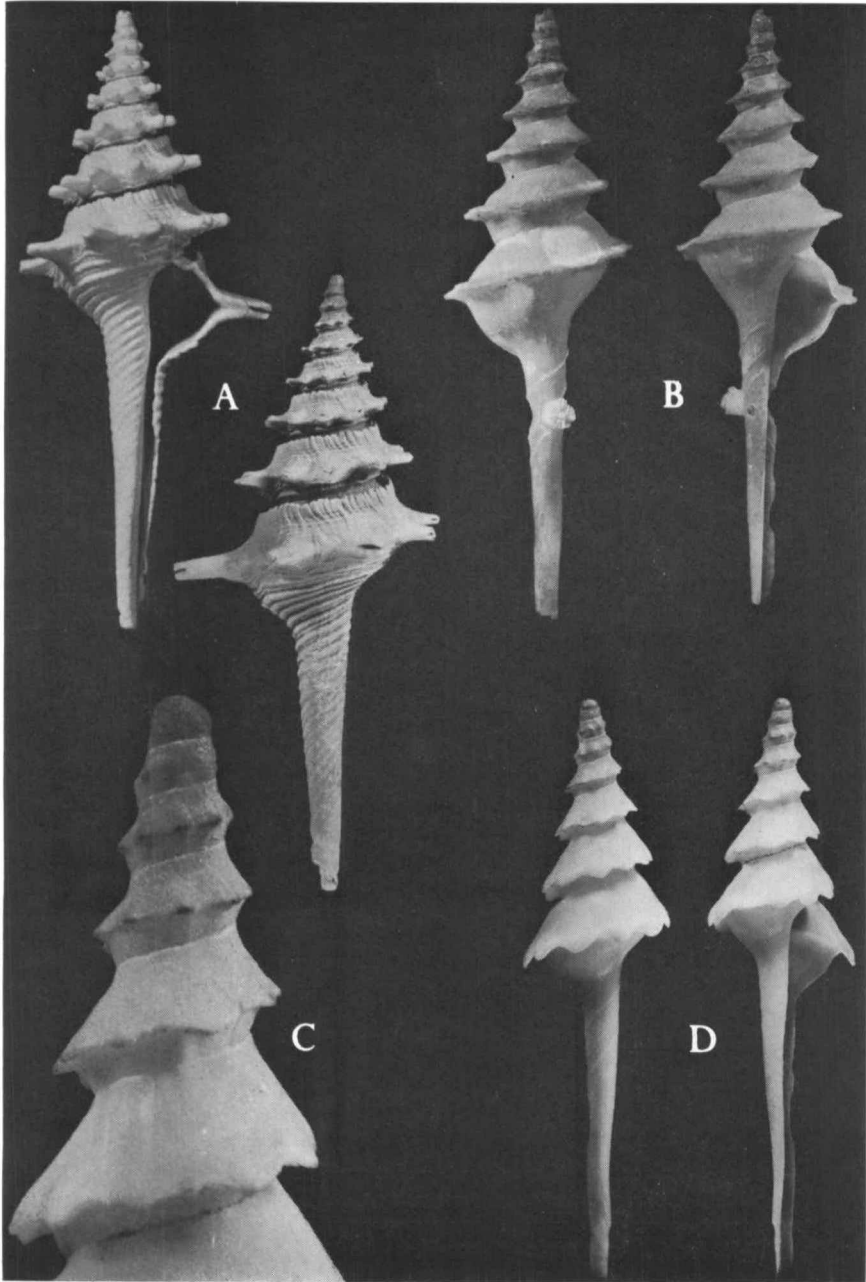
Type-Locality.—BLAKE Sta. 9, off Homers Cove, Jamaica: 18°12'N, 78°20'W, 254 fathoms (= 562 m).

Record.—PILLSBURY Sta. P-1225. SW of Jamaica: 17°42.5'N, 78°58.0'W, 546-528 meters, 6 July 1970.

Remarks.—Previously known only from the holotype and one paratype from BLAKE Sta. 9, this species is represented in the PILLSBURY collections by a single example trawled near the type-locality off Jamaica. Although it is a dead shell showing signs of deterioration, it conforms in all respects with the description of the original material.

→

FIGURE 38. Columbariidae. A, *Columbarium bartletti* Clench & Aguayo, Sta. P-1225, length 34.5 mm; B, *Columbarium bermudezi* Clench & Aguayo, Sta. G-1018, length 29 mm (anterior canal incomplete); C, apical whorls of D; D, *Columbarium bermudezi* Clench & Aguayo, Sta. G-1018, length 28.6 mm.



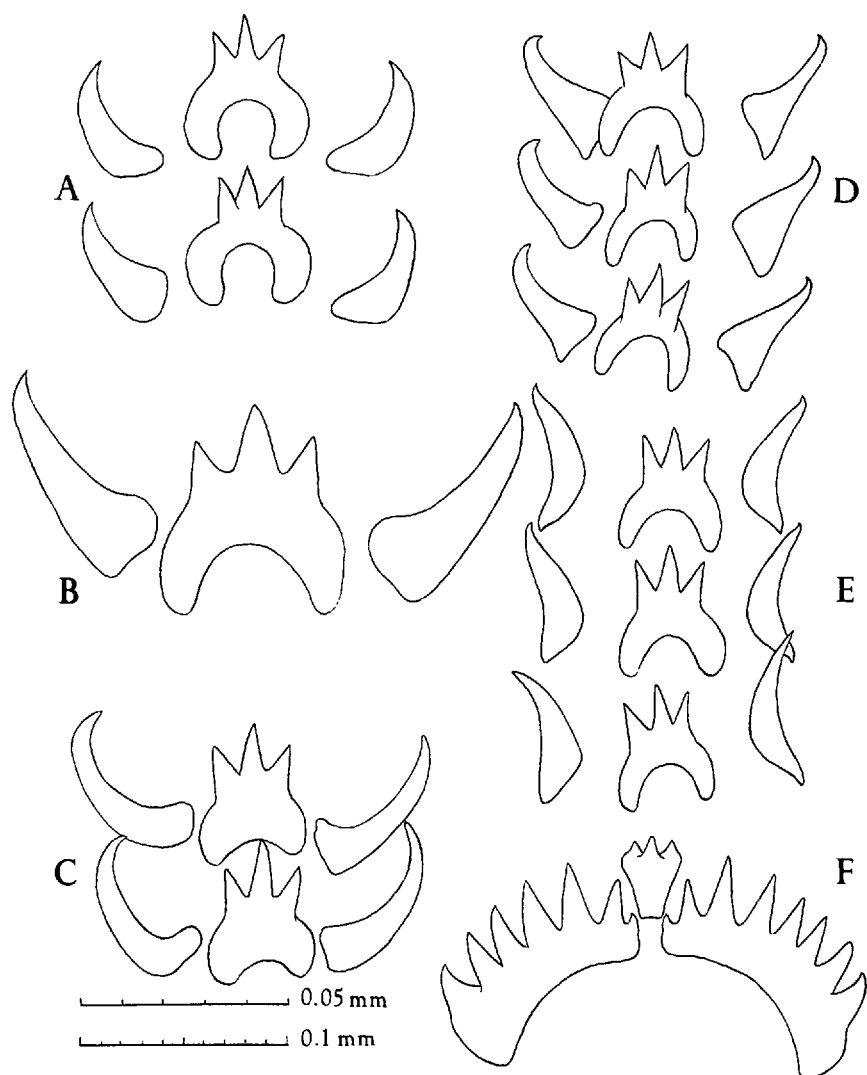


FIGURE 39. Radulae: A, *Columbarium bermudezi* Clench & Aguayo; B, *C. brayi* Clench; C, *Columbarium merope*, n. sp.; D, *Columbarium electra*, n. sp.; E, *Columbarium aurora*, n. sp.; F, *Fusinus eucosmius* Dall. The 0.05-mm scale applies to A-E; the 0.1-mm scale only to F.

32. *Columbarium (Fulgurofusus) bermudezi* Clench & Aguayo, 1938
Figs. 38, B-D; 39, A

Columbarium bermudezi Clench & Aguayo, 1938, Mem. Soc. Cub. Hist. Nat., 12: 383, pl. 28, fig. 7.—Clench, 1944, *Johnsonia*, 1(15): 2, pl. 1, fig. 3.
Fulgurofusus bermudezi Darragh, 1969, Proc. R. Soc. Vict., 83: 101, fig. 5, pl. 6, figs. 120-121.

Material Examined.—Eleven specimens from four stations as follows: GERDA Sta. 190, Northwest Providence Channel, NW of Great Stirrup Cay: 25°57'N, 78°07'W, 733-897 meters, 4 July 1963; 1 dead shell.—G-1015, Santaren Channel, west of Anguilla Cays: 23°34'N, 79°17'W, 525-516 m, 15 June 1968; 2 live shells, 1 dead, 1 fragment.—G-1017, Santaren Channel, midway between Cay Sal Bank and Great Bahama Bank: 23°58'N, 79°17'W, 555 m, 15 June 1968; 1 dead shell.—G-1018, Santaren Channel, ENE of Dog Rocks: 24°07'N, 79°28'W, 556 m, 15 June 1968; 1 live, 4 dead shells.

Remarks.—All eleven specimens obviously represent a single species of *Columbarium*. They agree in general with Clench's account (1944) of *C. bermudezi*, although all but one have a more prominent keel than do Clench's specimens. In two examples, the keel stands vertically at the periphery, but in all others it is distinctly deflected downward. It is curious that none of the specimens examined by Clench, from five ATLANTIS stations north of Cuba, showed this feature, but the variations present among the GERDA specimens make it necessary to identify the later as *C. bermudezi*.

In the present specimens, those that were collected alive show a thin periostracum that extends as a fine, sparse fringe of hairs from the edge of the carina. The radula has a tricuspid rachidian and a lateral with a single stout cusp (Fig. 39, A). The operculum has an apical nucleus.

33. *Columbarium (Fulgurofusus) brayi* Clench
Figs. 39, B; 40

Columbarium brayi Clench, 1959, *Johnsonia* 3(39): 330, pl. 173.
Fulgurofusus brayi Darragh, 1969, Proc. R. Soc. Vict., 83: 102, pl. 6, figs. 113, 115.

Originally described from two specimens dredged off Cabo Codera, Venezuela, in 150 fathoms (= 273 m), this species has now been taken at several additional localities in the southern Caribbean by R/V PILLSBURY. The material now available permits the first description of radula and operculum, and reveals considerable variation in shell characters.

Material Examined.—Thirty-four specimens² from the following stations: P-340, Panama, off Punta Mosquito, 9°14'N, 77°46'W, 307-366 meters,

² Measurements enclosed in square brackets indicate specimens with apex and/or anterior canal, and peripheral carina damaged.

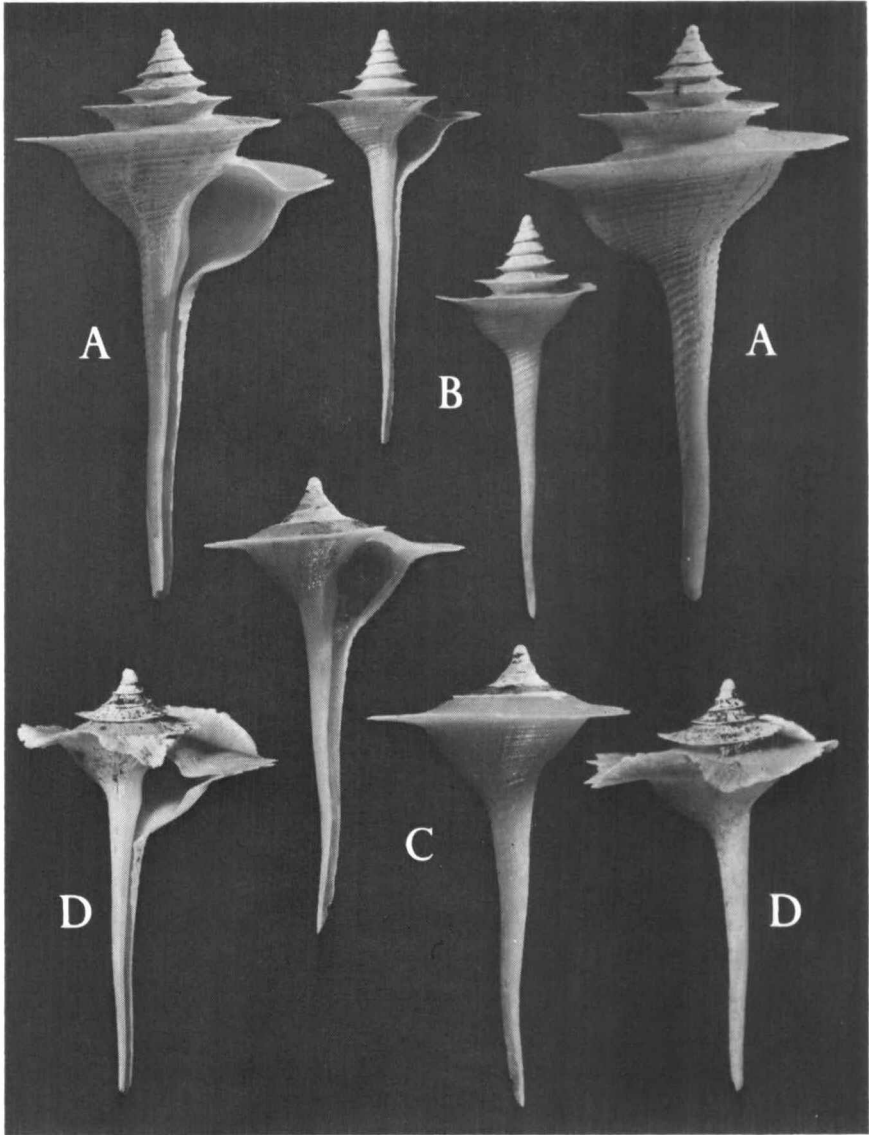


FIGURE 40. Columbariidae. *Columbarium brayi* Clench: A, from Sta. P-374, length 42.8 mm; B, from Sta. P-374, length 31.9 mm; C, from Sta. P-781, length 28.5 mm; D, from Sta. P-445, length 29.6 mm.

9 July 1966; three dead specimens: length 43.9 mm, width [21.6 mm]; length 43.9 mm, width 25.9 mm; length [32.4 mm], width [19.7 mm].—P-374, Colombia, NW of Golfo de Morrosquillo, 9°57'N, 76°11'W, 439-377 meters, 14 July 1966; two dead specimens: length 42.7 mm, width 23.8 mm; length 31.9 mm, width 12.9 mm.—P-386, Colombia, off Cartagena, 10°30'N, 75°42'W, 275-357 meters, 15 July 1966; one dead specimen: length 44.2 mm, width 23.1 mm.—P-394, Colombia, WNW of Golfo de Morrosquillo, 9°29'N, 76°26'W, 421-641 meters, 16 July 1966; eight specimens (6 dead): length [45.9 mm], width [26.4 mm]; length [46.2 mm], width [22.3 mm]; length [32.0 mm], width [20.2 mm]; length 42.1 mm, width 21.3 mm; length [39.0 mm], width [18.4 mm]; length [31.0 mm], width 19.3 mm; length 37.7 mm, width 19.2 mm; length 38.0 mm.—P-445, Panama, ESE of Escudo de Veraguas, 9°02'N, 81°24'W, 342-346 meters, 21 July 1966; six specimens (1 dead): length 35.6 mm, width 21.2 mm; length 29.7 mm, width 18.7 mm; length 29.5 mm, width 19.0 mm; length 28.5 mm, width 17.9 mm; length 27.7 mm, width 19.3 mm; length 27.5 mm, width 16.2 mm.—P-447, Panama, Golfo de los Mosquitos, 9°02'N, 81°07'W, 664-681 meters, 21 July 1966; three specimens (2 dead): length [17.7 mm], width [18.5 mm]; length [22.5 mm], width [18.9 mm]; length [18.0 mm], width [14.9 mm].—P-753, off Venezuela, 11°18.8'N, 68°22.0'W, 384-607 m, 26 July 1968; 1 specimen: length 57.3 mm, width 24.8 mm.—P-776, off eastern Colombia, 12°13.3'N, 72°50'W, 408-576 meters, 29 July 1968; one specimen: length [25.2 mm], width [16.5 mm].—P-781, off eastern Colombia, 11°30.1'N, 73°26.5'W, 567-531 meters, 30 July 1968; nine specimens (3 dead): length [36.3 mm], width 23.2 mm; length [35.9 mm], width 23.1 mm; length [34.8 mm], width [21.5 mm]; length [27.8 mm], width [28.9 mm]; length 28.6 mm, width 16.6 mm; length 26.3 mm, width 15.6 mm; length 17.6 mm, width [11.5 mm]; length 15.1 mm, width [8.4 mm]; length [15.1 mm], width [10 mm].

Operculum.—Thin, yellowish, with terminal nucleus.

Radula.—Rachidian tricuspid; lateral with a single strong, curved cusp (Fig. 39, B).

Variation.—Most of the specimens taken by R/V PILLSBURY differ from the type-material in having a lower spire and the carina placed higher on the whorls, closer to the suture. In the specimens from stations P-445, P-776, and P-781, the spire is so depressed and the suture so close to the carina of the preceding whorl that the typical "pagoda-like" profile is obliterated.

Clench (1959) noted a thin periostracum with short axial blades. In our material, this is so thin that it is almost invisible and there are no detectable "short axial blades" even in the young specimens that were alive when collected.

Range.—Southern part of the Caribbean Sea: the westernmost record is PILLSBURY station P-445 in Golfo de los Mosquitos, Panama (9°02'N, 81°24'W); the easternmost record is the type-locality, off Cabo Codera, Venezuela (11°N, 66°01'W). The species now has been taken from nine localities off Panama, Colombia, and Venezuela. The shallowest record is the type lot, from 150 fathoms (= 273 meters); the deepest verifiable record is 664 meters.

Columbarium brayi appears to be fairly common on mud bottom in the southern Caribbean at depths from 300 to 500 meters.

Peristarium, new subgenus

Diagnosis.—Elongate fusiform shells of small or moderate size, with extended spire and long, straight, tapered siphonal canal. Nucleus bulbous, glassy, of about two whorls, followed by about eight sculptured postnuclear whorls. The first few postnuclear whorls with angular peripheral nodes on low axial ribs, becoming obscure on the subsequent whorls, which are not carinate or spinose. Spiral sculpture consisting of low, narrow cords, more or less distinct. Radula typical of *Columbarium*, with an arched rachidian plate bearing three cusps, flanked on each side by a single flattened, curved, triangular lateral. Operculum thin, corneous, translucent yellow, ovate-unguiculate, with apical nucleus.

Type-Species.—*Columbarium (Peristarium) electra*, new species; here designated.

Gender.—Neuter.

Remarks.—These shells are similar to fusiform species of *Coluzea* from South Africa. They differ from Darragh's definition of that group by having no sharp distinction between nuclear and postnuclear whorls, and from most other species by lacking a flange-like or dentate keel.

34. *Columbarium (Peristarium) electra*, new species

Figs. 39, D; 41

Material Examined.—GERDA Sta. G-289. Straits of Florida SSE of Key West: 24°11'N, 81°36'W, 604-594 meters, 3 April 1964. Six specimens.

Description.—Shell elongate fusiform, with elevated spire and long, narrow, tapered siphonal canal. Color white. Whorls nine, regularly increasing in size; nuclear whorls about 1½, bulbous, smooth and glossy, not clearly delimited from the postnuclear whorls except by the initiation of a series of obscure peripheral nodes which become more prominent as the whorls increase in size. Each node is situated on a low, rounded axial ridge; the ridges are at first weak but become stronger on the second and third post-nuclear whorls, then gradually decrease in prominence until they are merely

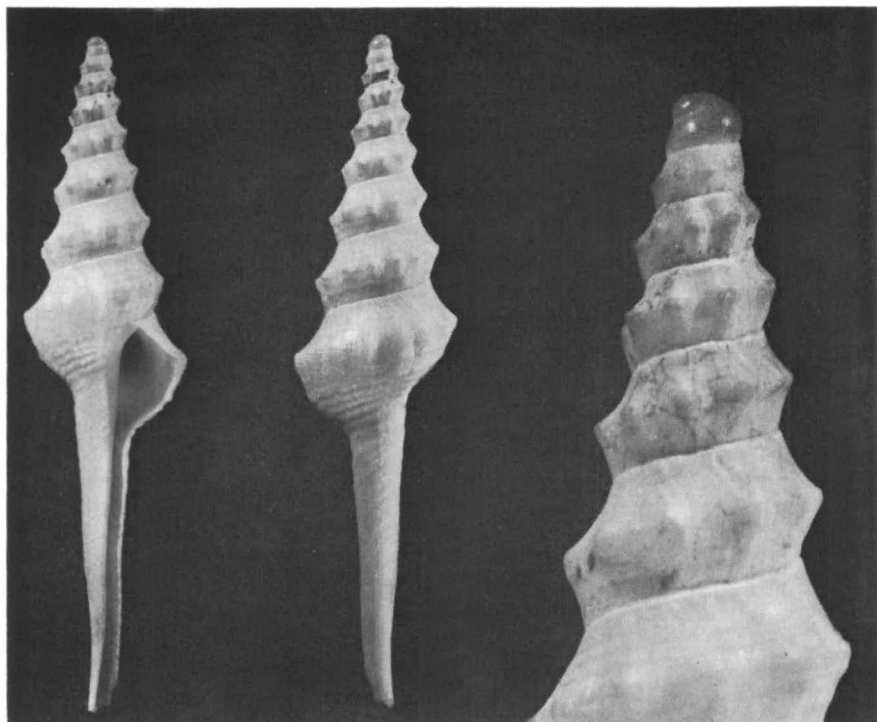


FIGURE 41. Columbariidae. *Columbarium (Peristarium) electra*, n. subgen., n. sp., holotype, Sta. G-289, length 26.85 mm.

low, broad axial undulations, 14 in number on the body whorl. Peripheral nodes low and blunt on the later whorls, where they lie about midway between sutures; 14 nodes occur on the body whorl, one on each axial rib. Growth lines visible on the last four postnuclear whorls. Faint spiral lines begin on about the fourth postnuclear whorl, becoming more distinct on the following whorls where they appear as narrow bands of slightly different texture only slightly raised from the adjacent shell surface. On the spire there are three of these major lines above the periphery, separated by much fainter ones. Three spiral lines follow the periphery and are more distinctly raised where they pass over the peripheral nodes. Below the nodes there is one principal spiral; on the body whorl there are five distinct spirals below the periphery (the suture follows the second) and another eight on the siphonal canal, fading out toward its end. Columella long, straight, imperforate, not plicated. Interior surface of outer wall smooth. Parietal wall without a distinct lip, smooth, the spiral sculpture obliterated. The

operculum is ovate-unguiculate, with apical nucleus. The radula has an arched tricuspid rachidian plate flanked by a triangular, clawlike lateral on each side (Fig. 39, D).

Measurements.—Length 26.85 mm, diameter at periphery 6.45 mm (holotype).

Holotype.—USNM No. 701151, from GERDA Sta. G-289.

Type-Locality.—Straits of Florida, SSE of Key West: 24°11'N, 81°36'W, 604-594 m.

Remarks.—The operculum is like that of *C. (Peristarium) merope*, n. sp., and other Caribbean species of the genus. (See Figure 43.)

35. ***Columbarium (Peristarium) merope***, new species
Figs. 39, C; 42; 43, A

Material Examined.—GERDA Sta. G-439, Straits of Florida, SW of Marquesas Keys (24°14'N, 82°29'W, 584-566 meters, 29 November 1964; two specimens, paratypes).—G-440, Straits of Florida, SW of Marquesas Keys (24°14'N, 82°21'W, 549-567 meters, 29 November 1964; one specimen, paratype).—G-476, Straits of Florida, SW of Marquesas Keys (24°14'N, 82°24'W, 549-512 meters, 26 January 1965; one specimen, holotype).—G-966, Straits of Florida, SW of Marquesas Keys (24°10'N, 82°22'W, 553-558 meters, 2 February 1968; one specimen, paratype).—G-970, Straits of Florida, S of Marquesas Keys (24°24'N, 82°08'W, 512 meters, 2 February 1968; one specimen, paratype).

Description.—Shell elongate fusiform, with elevated spire and long, narrow, tapering siphonal canal. Whorls $10\frac{1}{2}$, regularly increasing in size; nuclear whorls about two, bulbous, smooth and glossy, not clearly distinguished from the postnuclear whorls. First four whorls closely resembling those of *Columbarium electra*. In the course of the fourth turn, three spiral cords become conspicuous, one at the periphery and two below it. About the sixth whorl, five spirals become quite distinct above the periphery, and an intermediate spiral appears between the peripheral one and that below it, so that three broad spirals follow the periphery and pass over the nodes. Between the three peripheral spirals and the suture below there is at first one spiral cord, then by intercalation of one above and below it there are eventually three. On the body whorl of the largest specimen, there are ten strong spirals below the three peripheral ones, and about 24 extending down the siphonal canal and fading out terminally. Close-set axial growth lines are distinct on all the later whorls. The peripheral nodes occupy the summit of low, rounded, semilunate axial ribs, of which there are 12 on the body whorl of the largest examples. Columella long and straight, with-

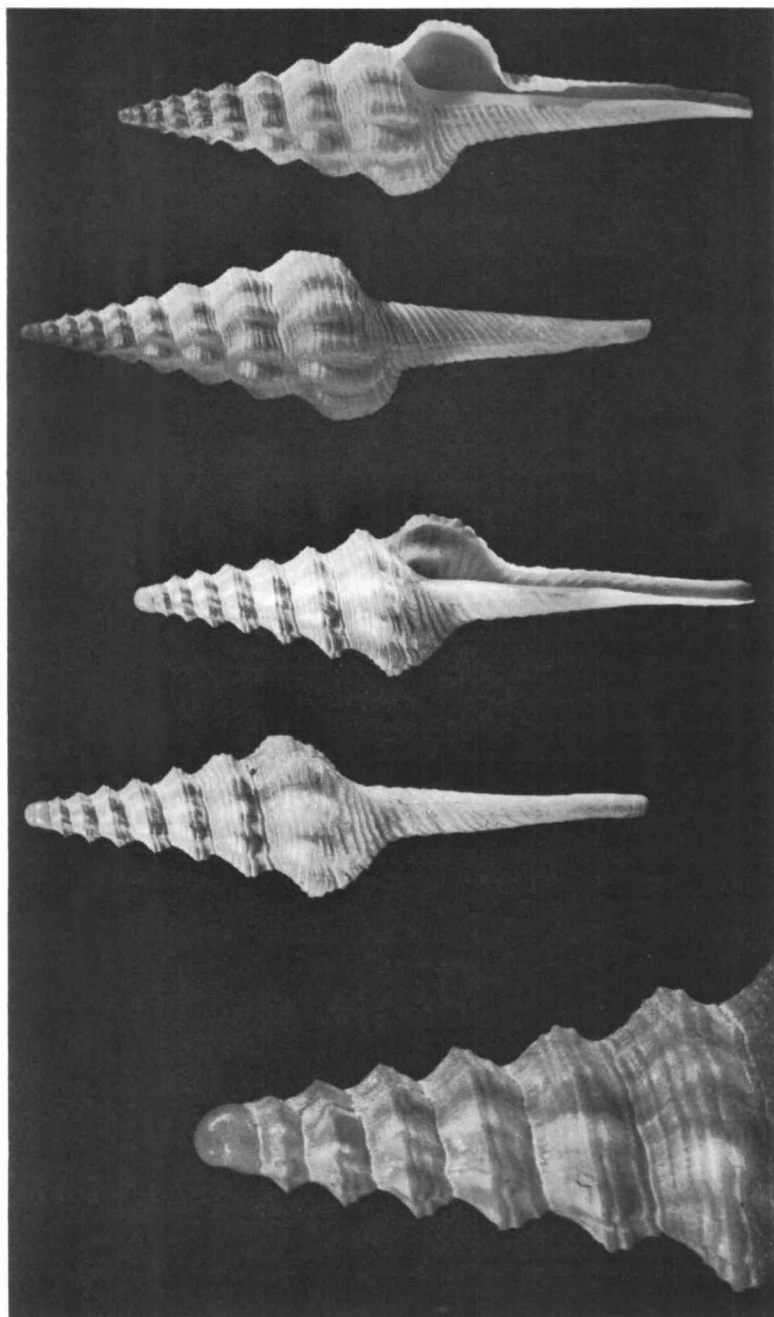


FIGURE 42. Columbariidae. *Columbarium* (*Peristarium*) *merope*, n. sp. Left to right: apical whorls of paratype from Sta. G-966; two views of entire shell of same, length 22.4 mm; two views of holotype from Sta. G-476, length 36 mm.

out trace of plications. Interior of aperture shows impressions of the exterior spiral cords in the younger specimens, but in the largest examples the interior of the outer wall is quite smooth. Parietal wall smooth, due to the removal of the sculptured superficial layer of shell. Periostracum thin, faintly yellowish, projecting along the growth lines as thin, narrow lamellae which are elongated into small, pointed projections along the raised spiral cords.

The operculum (Fig. 43, A) is like that of other species, yellowish, translucent, with apical nucleus. A colony of hydroids is attached to its outer surface in several cases.

The radula is virtually indistinguishable from that of other species of *Columbarium* (Fig. 39, C).

Measurements.—Length 36.0 mm, diameter at periphery 9.7 mm (holotype).

Holotype.—USNM No. 701152, from GERDA Sta. G-476.

Type-Locality.—Southern part of the Straits of Florida, SW of Marquesas Keys, 24°14'N, 82°24'W, 540-512 meters.

Remarks.—This species is distinguished from *Columbarium* (*Peristarium*) *electra* by its stronger spiral sculpture. From *C. (P.) aurora*, which is similarly sculptured, it is distinguished by its more angular whorls, by the more abrupt transition of the body whorl basally into the siphonal canal, and by the proportionally higher spire and shorter siphonal canal.

All of the known specimens were taken in the lower Straits of Florida in an area south of the Marquesas Keys in depths between 512 and 584 meters. *Columbarium aurora* so far has been taken only from the straits in the area off Miami, Florida. Many stations made at comparable depths in intermediate localities have not yielded specimens of either species.

36. *Columbarium* (*Peristarium*) *aurora*, new species

Figs. 39, E; 43, B; 44

Material Examined.—GERDA Sta. G-62, Straits of Florida, SE of Fowey Light (25°30.5'N, 80°00'W, 403-384 m, 29 August 1962; one specimen, paratype).—G-66, Straits of Florida, SE of Fowey Light (25°25.5'N, 79°59'W, 366 m, 26 September 1962; one specimen, paratype).—G-67, Straits of Florida, SE of Fowey Light (25°31'N, 79°57'W, 351 m, 26 September 1962; two specimens, paratypes).—G-828, Straits of Florida, E of Fowey Light (25°34'N, 79°57'W, 333-340 m, 7 July 1967; one specimen, paratype).—PILLSBURY Sta. P-1309, Straits of Florida, NE of Fowey Light (25°40'N, 80°02'W, 247 m, 5 December 1970; four specimens, holotype and paratypes).

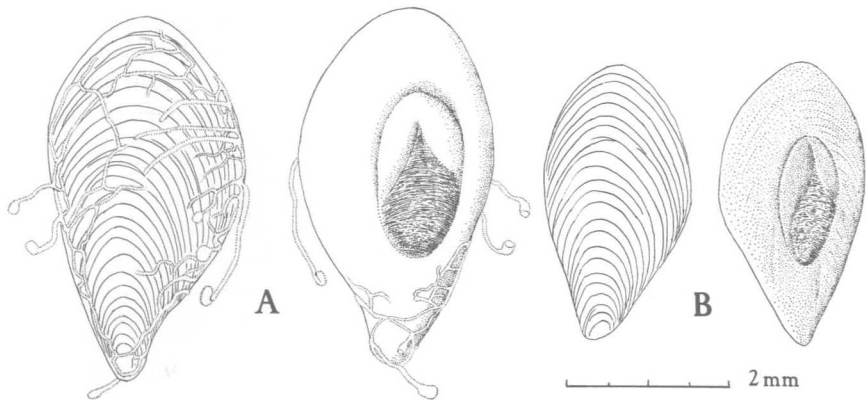


FIGURE 43. Opercula: A, *Columbarium (Peristarium) merope*, n. sp.; B, *Columbarium aurora*, n. sp.

Description.—Shell elongate fusiform, with elevated spire and prolonged siphonal canal much as in *Columbarium merope*. Color white, some specimens more or less strongly suffused with pink, especially on the body whorl and siphonal canal. Whorls ten, of which two form the smooth, bulbous nucleus. After the second nuclear whorl, low axial ribs with a distinct angular projection at the periphery appear and become stronger on the following whorls. Third whorl with about 11 axials, body whorl with 12-16. About the third turn, two spiral cords appear above the periphery; one passes over the peripheral nodes, and one below the periphery close to the suture. By the sixth whorl there are about six spirals above the peripheral one (including the broad subsutural one) and from one to three below it; on the body whorl, there are 16-23 spirals followed on the siphonal canal by as many as 40 (of which several are narrow intercalaries); those near the tip of the canal become weak but remain visible up to the line along which the direction of the growth lines changes near the end of the canal. On the early whorls, the spirals are narrow, flat, separated by interspaces wider than the cords. On the later whorls the cords become progressively wider until, on the body whorl, they are wider than the interspaces which, in some cases, are reduced to narrow grooves. Although the axial sculpture persists on all the postnuclear whorls, the peripheral angulation becomes less distinct from the sixth whorl onward and is hardly perceptible on the body whorl. The columella is long, nearly straight, lacking plications. The tip of the siphonal canal is more or less deflected upward, especially in larger specimens. Inside of outer lip smooth; parietal wall smooth where the mantle has removed the sculpture, without raised

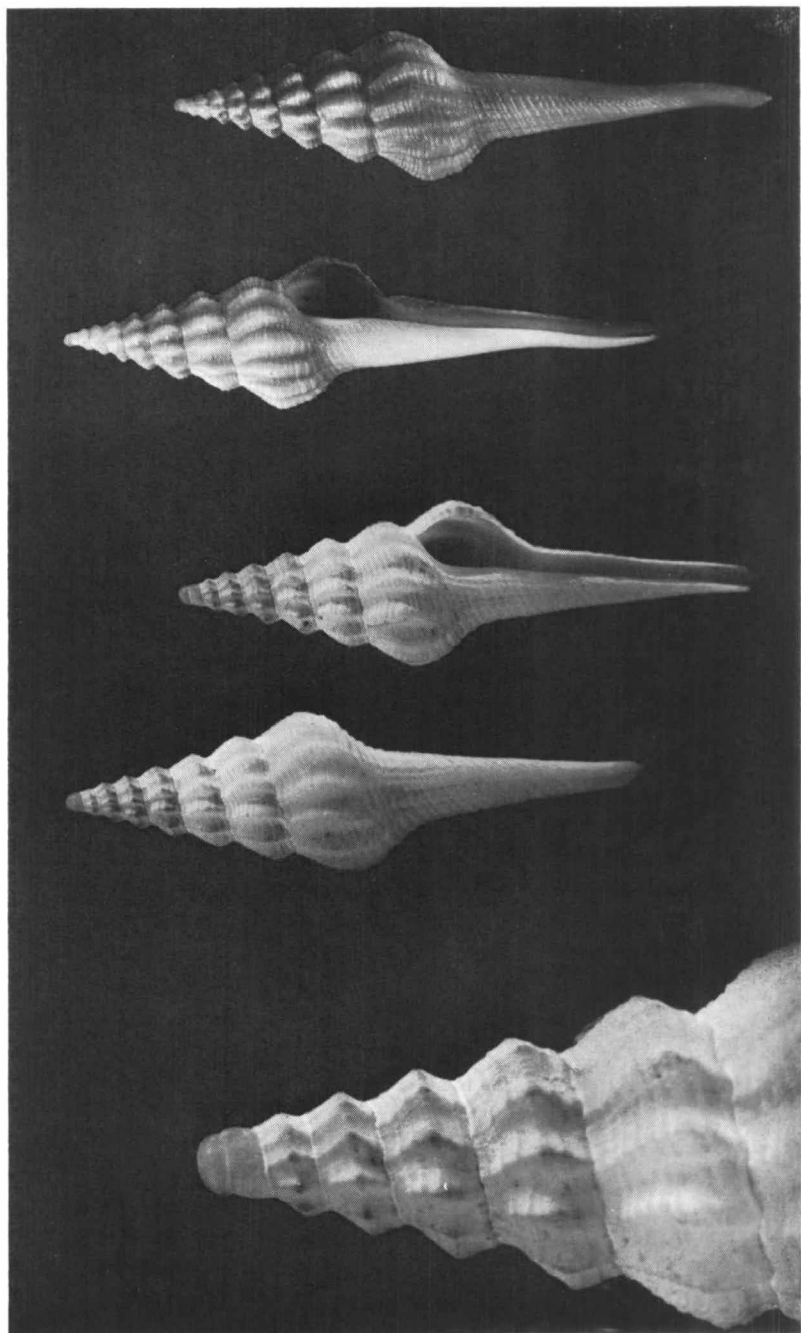


FIGURE 44. Columbariidae. *Columbarium aurora*, n. sp. Left to right: apical whorls of paratype from Sta. G-62; two views of entire shell of same, length 25.9 mm; two views of holotype from Sta. P-1309, length 41.4 mm.

parietal lip. Periostracum thin, yellowish, forming short projecting fringes along the course of the spiral cords, most noticeable in small specimens.

The operculum (Fig. 43, B) is like that of the other species herein described. The radula (Fig. 39, E) conforms closely to that of other species of *Columbarium*.

Measurements.—Length 41.4 mm, diameter at periphery 10.5 mm (holotype); length 25.9 mm, diameter 7.2 mm (paratype); largest specimen, length 43 mm (apex decollated), diameter 11.3 mm (P-1309); smallest specimen, length 22.4 mm, diameter 6.1 mm (G-67).

Holotype.—USNM No. 701222, from PILLSBURY Sta. P-1309.

Paratypes.—USNM No. 701153, from GERDA Sta. G-62. Others in the collection of the Rosenstiel School of Marine and Atmospheric Sciences.

Type-Locality.—Straits of Florida, off Fowey Light, 25°40'N, 80°02.8'W, 247 m.

Remarks.—This species is distinguished from *Columbarium* (*Peristarium*) *merope* by the rounded shoulder of the later whorls, the smoother gradation of the body whorl into the siphonal canal, which is more conspicuously tapered, and the relatively shorter spire and longer siphonal canal.

Columbarium aurora, like *C. electra* and *C. merope*, closely resembles a small *Fusinus*. All are distinguished from that genus by both radular and nuclear characters. Figures of the shell and apex (Fig. 45) and of the radula (Fig. 39, F) of *Fusinus eucosmius* Dall are introduced here for comparison.

Family Coralliophilidae
(= Rapidae, = Magilidae)

The genus *Coralliophila* has been subdivided to such an extent that it is difficult, if not impossible, to assign many species unequivocally to a genus-group taxon. *Latiaxis* Swainson, established for *Pyrula mawae* Griffith & Pidgeon, characterized by its depressed spire, imbricated flattened spines at the shoulder and margin of the umbilicus, and loosely coiled whorls with the spiral sculpture otherwise not strongly imbricated, is distinctive but should be restricted to species such as *L. mawae* and *L. pilsbryi* Hirase. No species of this group has been found in the West Atlantic. The allocation of species such as *C. deburghiae* (from Japan) and *C. dalli* (from Florida), with elevated spire as well as prominent flat spines at the shoulder, to the genus *Latiaxis* seems to lack justification. Accordingly, I prefer to assign all the western Atlantic forms to *Coralliophila* sensu lato. Except for *C. lactuca* Dall, with its strong axial sculpture, there is no reliable generic distinction among them.

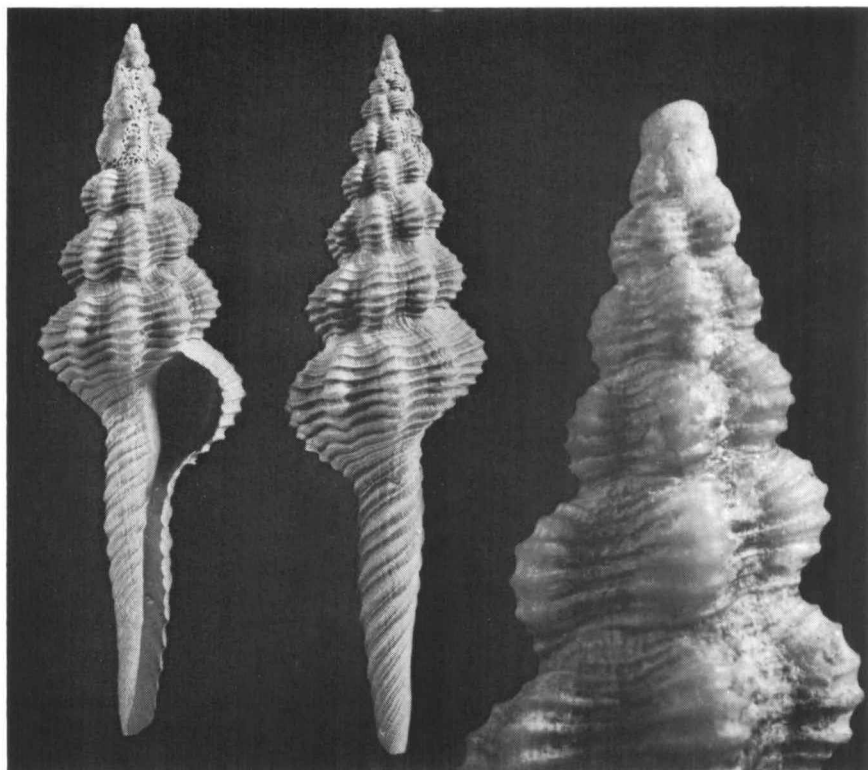


FIGURE 45. Fusinidae. *Fusinus eucosmius* Dall, Sta. G-1039, length 55 mm; shell (periostracum removed) and apical whorls.

Genus *Coralliophila* H. & A. Adams

Coralliophila H. & A. Adams, 1853, Gen. Recent Mollusks, 1: 135.—Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 217.—Abbott, 1958, Monogr. Acad. nat. Sci. Philad., no. 11: 65.

Latiaxis (*partim*), Auctt., non Swainson, 1840.

Abbott (1958) has reviewed the shallow-water species of this genus known from the Caribbean area. Some of them descend into moderate depths and may be taken by dredging.

37. *Coralliophila dalli* (Emerson & D'Attilio)

Fig. 46

Coralliophila deburghiae, Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 218, pl. 16, fig. 5; 1889b, Bull. U. S. natn. Mus., 37: 122, pl. 16, fig. 5 (also second ed. in 1903).—Smith, 1937, East Coast Marine Shells: 118

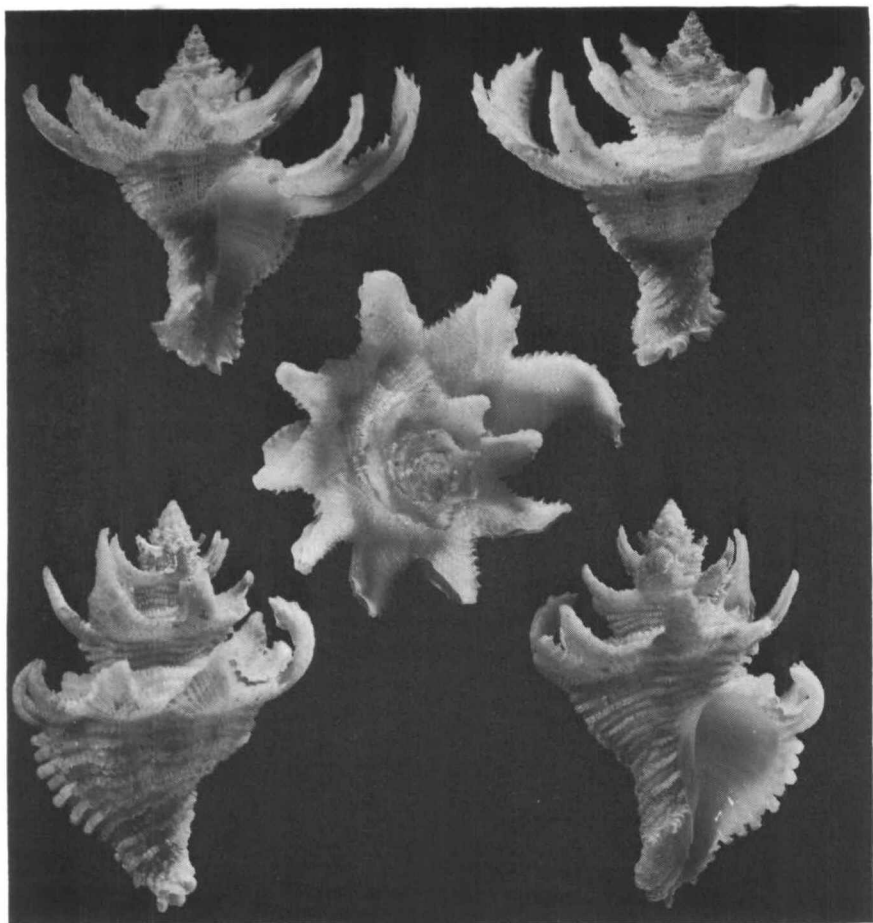


FIGURE 46. Coralliophilidae. *Coralliophila dalli* (Emerson & d'Attilio): upper, three views of specimen from Sta. G-1206, height 28 mm, width overall, 31.5 mm; lower, two views of specimen from Sta. G-394, height 33.1 mm, width overall 24 mm.

(but not pl. 58, fig. 5); 1939, Illustr. Cat. Rock Shells: 32, in part (pl. 20, fig. 11?).

Not *Pyrula* (*Rhizochilus*) *deburghiae* Reeve, 1857, Proc. Zool. Soc. Lond. Part 25: 208, pl. 38, fig. 3a, b.

Latiaxis (*Babelomurex*) *dalli* Emerson & D'Attilio, 1963, Am. Mus. Nov., No. 2149: 4, figs. 1-3.

Material Examined.—GERDA Sta. G-394, NW of Little Bahama Bank (27°22'N, 79°11'W, 223 meters, 19 September 1964; 2).—G-1206, North-

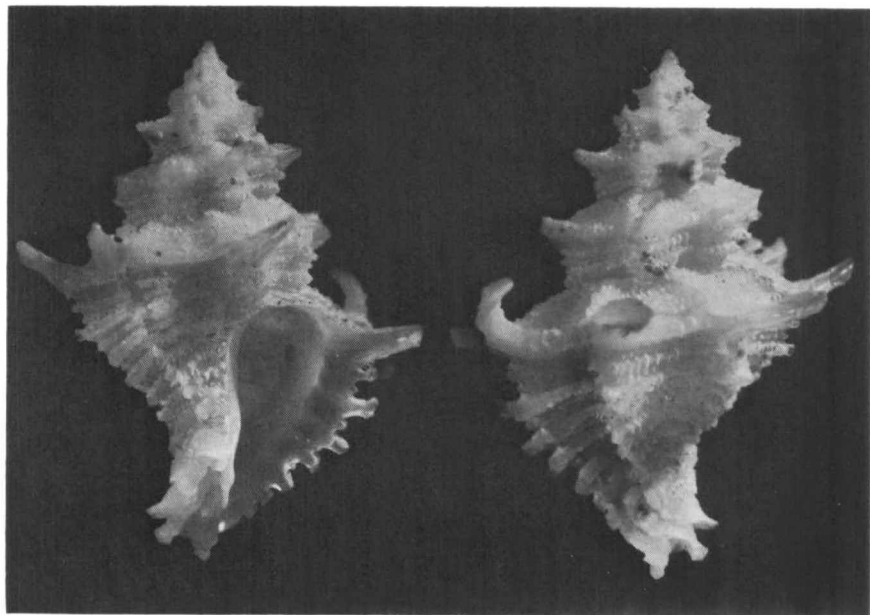


FIGURE 47. Coralliophilidae. *Coralliophila mansfieldi* (McGinty), Sta. P-405, height 18.3 mm.

west Providence Channel (26°17'N, 78°54'W, 394-420 meters, 20 August 1969; 1).

PILLSBURY Sta. P-890, Lesser Antilles, NE of St. Lucia (14°05.6'N, 60°51.4'W, 198-430 meters, 7 July 1969; 1).—P-943, Lesser Antilles, off Grande Terre, Guadeloupe (16°25.9'N, 61°36.7'W, 275 meters, 17 July 1969; 8).

Remarks.—This long-misidentified species, first figured by Dall (1889a), has been obtained at several localities during explorations by R/V GERDA and R/V PILLSBURY. Ornate examples of *Coralliophila mansfieldi* from shallow water sometimes have been called "*Coralliophila deburghiae*" in error; the specimen figured by Smith (1939, pl. 20, fig. 11) may be such a shell.

Although the flattened, up-curved peripheral blades vary as to length and degree of curvature, they appear to be characteristic of the species. Specimens with the spines suppressed, treated by Dall under the varietal names *fusiformis* and *Lintoni*, are here considered specifically distinct.

In *Coralliophila dalli*, the spiral sculpture is much more prominent and more strongly imbricated than in *C. fax* and *C. sentix*, new species. On

the upper slope of the whorls, one of the spiral cords (third or fourth from the suture) is more prominent and lies about midway between the suture and the base of the carina.

38. *Coralliophila mansfieldi* (McGinty)

Fig. 47

Muricidea mansfieldi McGinty, 1940, *Nautilus*, 53: 83, pl. 10, figs. 5, 5a. (Fossil, Caloosahatchee Marl, Clewiston, Florida.)

Coralliophila mansfieldi, Pilsbry & McGinty, 1949, *Nautilus*, 63: 11, pl. 1, figs. 2-3. (Recent, Palm Beach Inlet, Biscayne Bay, and Destin, Florida.)

Latiaxis (Babelomurex) mansfieldi, Emerson & D'Attilio, 1963, *Am. Mus. Novit.*, No. 2149: 7, fig. 4.

This species, not uncommonly taken in shallow water in southern Florida from Palm Beach Inlet southward, sometimes was identified as *C. deburghiae* by collectors. It was tentatively synonymized with *C. scalariformis* (Lamarck) by Abbott (1958: 66), but it does not very closely resemble that species as figured by Kiener (1836: pl. 19, fig. 55). Specimens obtained by R/V PILLSBURY in the southwestern Caribbean (Fig. 47) do not differ in any significant way from shallow-water specimens from Florida.

Record.—PILLSBURY Sta. P-405, Gulf of Uraba, 8°49'N, 77°21'W, 92-93 m, 17 July 1966. Two specimens.

39. *Coralliophila tectumsinensis* (Deshayes)

Fig. 48

Murex Tectum Sinense Deshayes, 1856, *J. Conchyliol.*, 5: 78, pl. 3, figs. 1-2 (Habite les côtes de l'Algérie).

Rhizochilus (Coralliophila) bracteata, part, Tryon, 1880, *Man. Conch.*, 2: 210, pl. 66, fig. 380.

Material Examined.—PILLSBURY Sta. P-650, off French Guiana (6°07'N, 52°19'W, 46-50 meters, 8 July 1968; 1).—P-729, off Venezuela, SE of Isla Tortuga (10°41.1'N, 65°17.4'W, 720-725 meters, 22 July 1968; 1).

Description.—Shell of rather small size and solid structure, with elevated spire, the whorls strongly shouldered, carinated; body whorl somewhat inflated, anterior canal short but distinct, siphonal fasciole prominent, enclosing a shallow, funnel-like umbilical excavation. Aperture broadly ovate, narrowing toward the siphonal canal. First nuclear whorl lost, total number of whorls probably eight. Sculpture consisting of low, rounded axial ribs beginning about the third whorl and numbering about ten on the body whorl, crossed by imbricated spiral cords. Shoulder carinated, ornamented with flattened, triangular, upturned spines where it is crossed by the axial ribs. Slope above the carina sculptured by about ten spiral cords with thin, raised, imbricating scales; upper surface of carina with about three smaller,

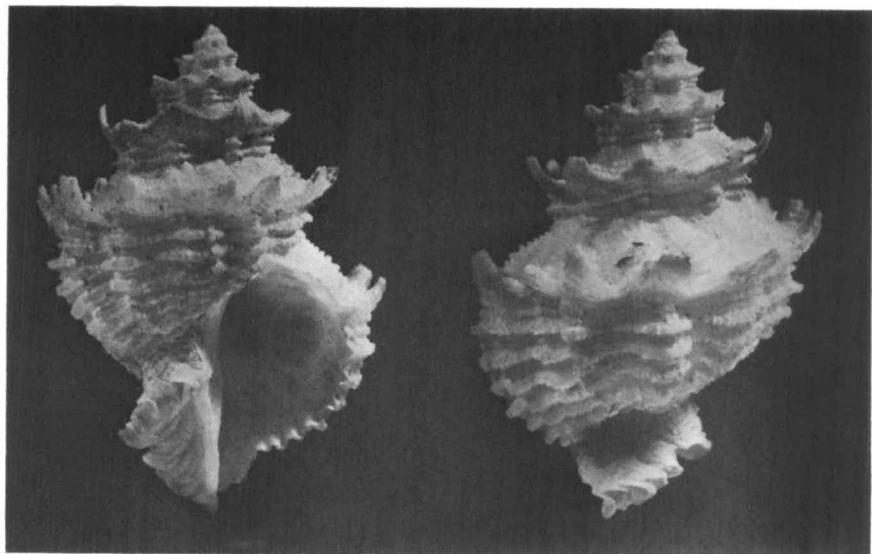


FIGURE 48. Coralliophilidae. *Coralliophila tectumsinensis* (Deshayes) Sta. P-729, height 24 mm.

scaled cords extending out onto the spines. On the body whorl there are about seven major cords below the carina, separated by another six or seven secondary cords, all conspicuously imbricated where crossed by the axial growth-lamellae. Interior of outer lip with nine smooth, sharp lirations; parietal wall smooth, obliterating the surface sculpture, somewhat raised at its margin to form a thin parietal lip. Color white, the upper whorls tinged with light brown; aperture white.

Measurements.—Length 12.5 mm, width overall 10 mm (P-650); length 24 mm, width overall 17.1 mm (P-729).

Remarks.—A specimen of *Coralliophila* from the Weinkauff collection of Mediterranean shells now in the U. S. National Museum of Natural History, originally identified as *C. tectumsinensis* Deshayes, agrees closely with the present material, and both correspond well with Deshayes' description and figure (1856) of the original specimen from Algeria. *C. babelis* Requien (type-species of the subgenus *Babelomurex* Coen), synonymized with *C. bracteata* Brocchi by Tryon (1880), has a more slender shell with longer anterior canal, and the upper slope of the whorls has only three or four strong, imbricated spirals rather than 18 or 19 narrow ones.

It is possible that the West Indian material will merit subspecific recognition upon more intensive study, as the sculpture is somewhat coarser,

especially on the upper slope, than in the Mediterranean specimen in the National Museum collections. However, these shells show so much variation that separating them at this time is not warranted.

40. *Coralliophila sentix*, new species

Fig. 49

Material Examined.—PILLSBURY Sta. P-876, Lesser Antilles, E of St. Vincent (13°13.9'N, 61°04.7'W, 231-258 meters, 6 July 1969. Two live specimens).—P-903, Lesser Antilles, SW of St. Lucia (13°44'N, 61°03.1'W, 231-430 meters, 9 July 1969; one shell dead but fresh).

Description.—Shell of moderate size and solid structure, with elevated spire, prominent anterior canal, and strongly carinate, shouldered whorls. Columella straight, openly perforate, umbilicus bounded by a distinct siphonal fasciole imbricated by the preceding temporary ends of the siphonal canal. Aperture ovate, the outer lip of mature specimens with about eight internal lirations. Nuclear whorls lost in all specimens examined; largest specimens with seven remaining whorls, total probably nine. Carina moderately wide, rather thick, strongly upturned, irregularly serrated marginally; the marginal projections are extensively damaged in the two larger examples, less so in the smallest one. Projections flat, triangular, with the apex curved backward more or less, sometimes joining the forward edge of the preceding spine. Early postnuclear whorls developing flattened spines where axial ribs cross the shoulder, axial component becoming obscure with increasing size of shell, persisting only as a succession of slightly thickened former outer-lip edges; intermediate axial growth lines inconspicuous. Spiral sculpture distinct, only moderately imbricated. Above the carina the spirals are weaker than below it, the primary ones further marked by very fine secondary spirals, all diverging outward onto the carinal spines. Below the carina there are about 20 spiral cords on the body whorl; another 15 or more, less regular, mark the lower surface of the carina and diverge centrifugally out onto the spines. Color white, more or less flushed with pinkish tan; interior of aperture white, with or without pinkish tints in the throat.

Measurements.—Length 28.6 mm (holotype); length 16.35 mm (paratype, P-876); length 36.2 mm (paratype, P-903).

Holotype.—USNM No. 701155, from PILLSBURY Sta. P-876.

Type-Locality.—East of St. Vincent, Lesser Antilles, Sta. P-876.

Paratype.—USNM No. 701156, from PILLSBURY Sta. P-903.

Remarks.—In general appearance, this species resembles "*Latiaxis*" na-

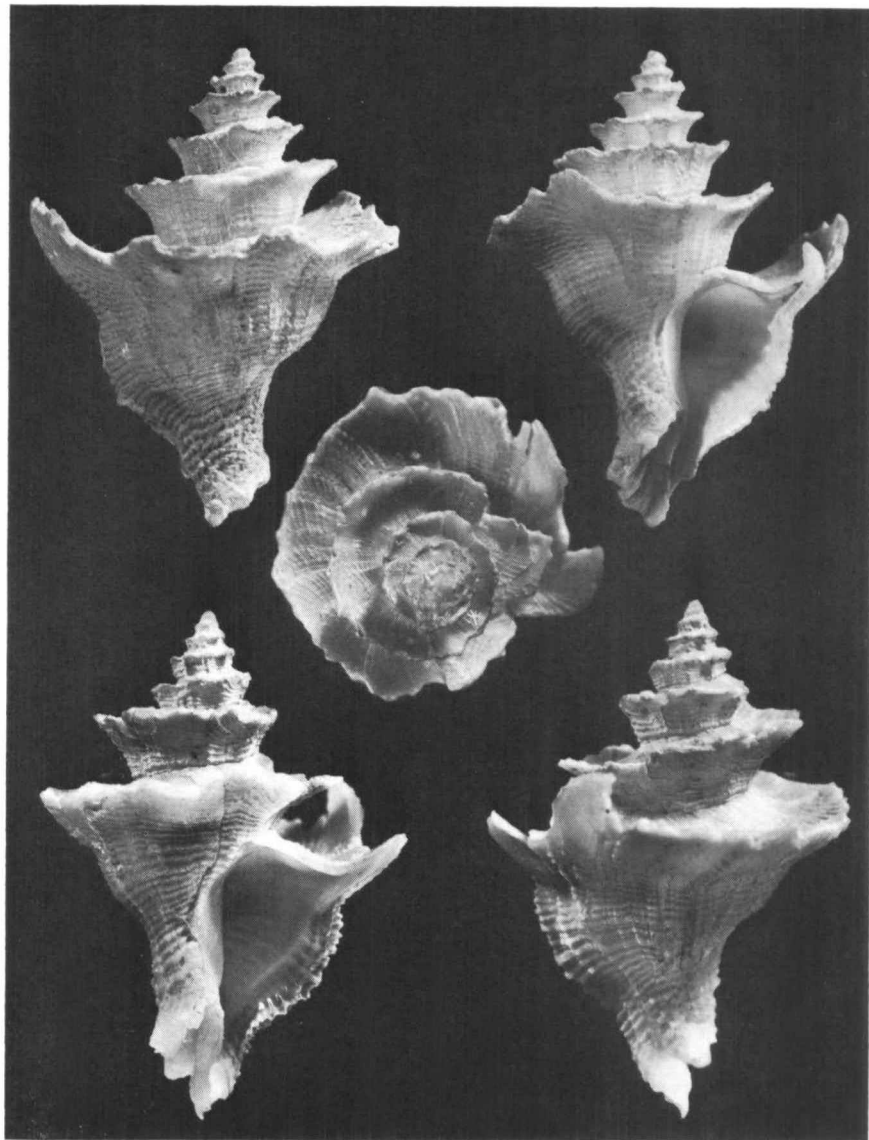


FIGURE 49. Coralliophilidae. *Coralliophila sentix*, n. sp.: upper, two views of paratype from Sta. P-903, height 36.2 mm; lower, three views of holotype from Sta. P-876, height 28.7 mm.

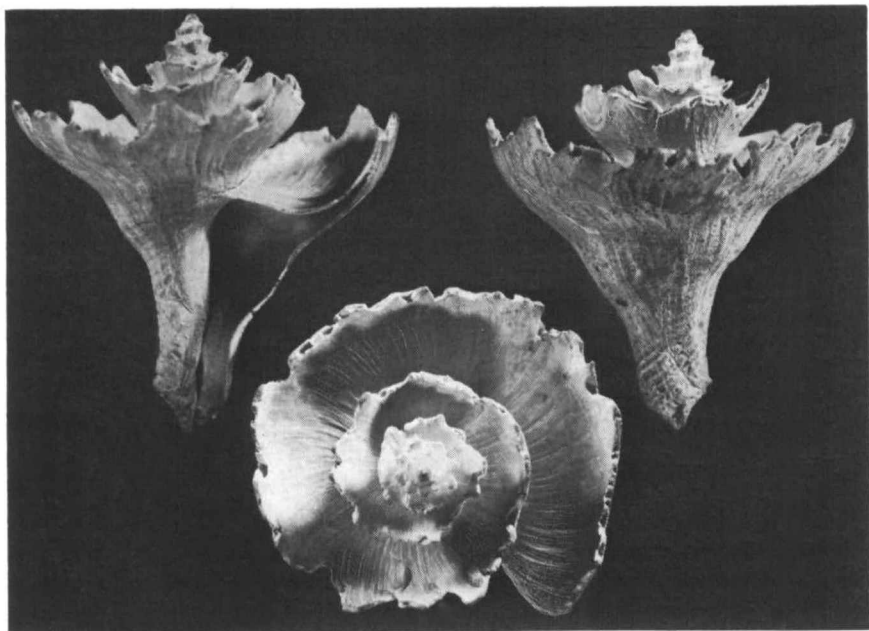


FIGURE 50. Coralliophilidae. *Coralliophila fax*, n. sp., holotype, Sta. G-1125, height 24.4 mm.

kamigawai Kuroda from Japan (see Shikama & Horikoshi, 1963: pl. 61, fig. 2). It is quite distinct from other West Indian coralliophilids. The broader and more confluent carinal blades and much weaker spiral sculpture distinguish *Coralliophila sentix* from *C. dalli*, whereas it is heavier, coarser, and more strongly sculptured than *C. fax*.

41. *Coralliophila fax*, new species
Fig. 50

Material Examined.—GERDA Sta. 1125, Straits of Florida, NW of Settlement Point, Grand Bahama: 26°45'N, 79°05'W, 494-530 meters, 13 June 1969, one specimen.

Description.—Shell of moderate size, thin and light in construction, with a narrow, elevated spire, moderately produced siphonal canal, and strongly carinate, shouldered whorls. Columella straight, narrowly perforate, umbilicus bounded by a narrow siphonal fasciole marked by imbricated sculpture. Aperture triangular, outer lip without interior lirations. Nuclear whorls missing and early postnuclear whorls eroded; almost 7 whorls remaining. Carina broad, thin, widely upturned, broadly serrated marginally;

the marginal serrations, which are not filled with shelly material, are mostly broken in this specimen, and probably would be more or less so, even in living specimens. The sculpture of the early whorls consists of flattened, probably upturned, spines where low axial ribs cross the shoulder. The third and fourth preserved postnuclear whorls show a distinct raised spiral ridge just above the suture, but this becomes less prominent on the later whorls and is evident on the body whorl only as a slightly more prominent, low spiral cord. Axial growth lines rather irregular but distinct. Spiral sculpture of low, broad threads without prominent imbrication. Shell dead, discolored a uniform dull grey.

Measurements.—Length 24.4 mm, width including carina (edge imperfect) 22.7 mm (holotype).

Holotype.—USNM No. 701154, from GERDA Sta. G-1125.

Type-Locality.—Straits of Florida, off Settlement Point, Grand Bahama, Sta. G-1125.

Remarks.—The broad, marginally serrated carina of this species superficially resembles that of the Japanese *Latiaxis mawae* (Griffith & Pidgeon), but in that species the spire is depressed, the parietal lip is free of the preceding whorl in mature shells, and the umbilicus is widely open. From *Coralliophila dalli*, this species differs in the form of the carina, the nearly smooth surface, and the narrow umbilical opening.

42. *Coralliophila lamellosa* (Philippi)

Fig. 51

Fusus lamellosus Philippi, 1836, Enumeratio Molluscorum Siciliae, 1: pl. 11, fig. 30.

Trophon Lintoni Verrill & Smith, 1882, Amer. Journ. Sci., 24: 365.—Verrill, 1884, Trans. Conn. Acad., 6: 176, pl. 29, fig. 1.

Coralliophila Deburghiae Reeve var. *Lintoni*, Dall, 1889a, Bull. Mus. comp. Harv., 18: 219; 1889b, Bull. U. S. Nat. Mus., 37: 122, 190, pl. 44, fig. 1.—Smith, 1939, Illustr. Cat. Rock Shells: 32, pl. 15, fig. 19 (photo of type-specimen).

Material Examined.—GERDA station G-170, Straits of Florida, E of Hobe Sound, Florida (27°06'N, 79°32'W, 677-659 meters, 29 June 1963; one specimen, length 18.1 mm, width 11.6 mm).—G-1082, Straits of Florida, SE of Marquesas Keys (24°24.5'N, 82°02.5'W, 115 meters, 26 April 1969; one specimen, length 30.6 mm, width 18.2 mm).—PILLSBURY Sta. P-605, northwestern Caribbean Sea, NW of Chinchorro Bank, Yucatan (18°50.1' N, 87°31.5'W, 695-772 meters, 17 March 1968; one specimen, length 26.2 mm, width 16.6 mm).

Remarks.—Direct comparison of *Coralliophila lamellosa* (Philippi) from

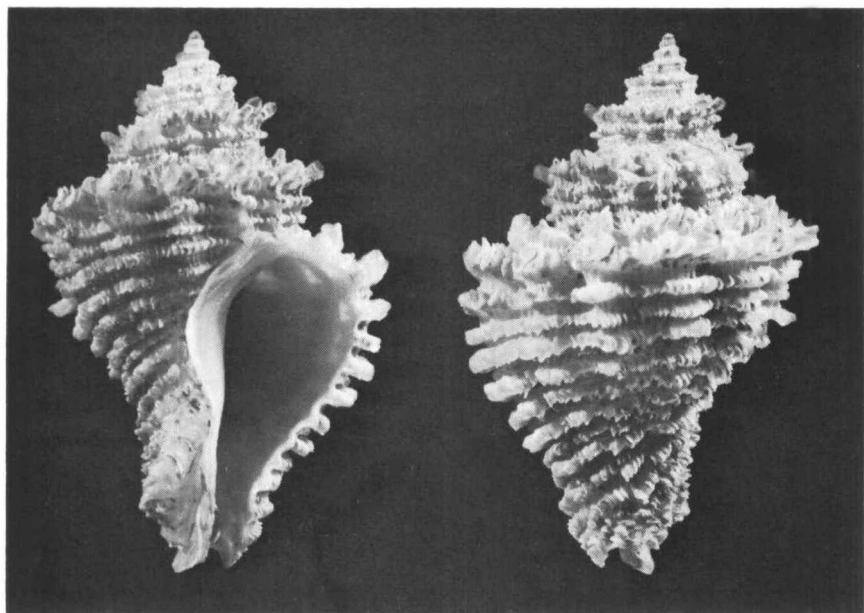


FIGURE 51. Coralliophilidae. *Coralliophila lamellosa* (Philippi), Sta. P-605, length 26.2 mm.

Sardinia (USNM No. 192734, Tiberi Coll.) with *Coralliophila lintoni* from south of Cuba (USNM No. 93243, ALBATROSS Sta. 2129, 274 fm) and the holotype of *Trophon lintoni* Verrill & Smith from ALBATROSS Sta. 1118 (USNM No. 77269) reveals no significant differences. Moreover, all agree satisfactorily with the present material. The specimen from GERDA Sta. G-1082 is very similar to Verrill & Smith's type of *T. lintoni*. Those from Stas. G-170 and P-605 are somewhat more shouldered, as in Dall's *C. deburghiae* var. *lintoni* from the Caribbean.

43. *Coralliophila lactuca* Dall, 1889

Fig. 52

Coralliophila lactuca Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 220, pl. 16, fig. 6; 1889b, Bull. U. S. Nat. Mus., 37: 122, pl. 16, fig. 6.

Material Examined.—GERDA Sta. G-67, Straits of Florida, off Cape Florida (25°31'N, 79°57'W, 351 meters, 26 September 1962; one dead shell, length 11.9 mm).—G-179, Straits of Florida, NW of Little Bahama Bank (27°41'N, 79°11'W, 549-567 meters, 1 July 1963; one live specimen, length 10.4 mm).

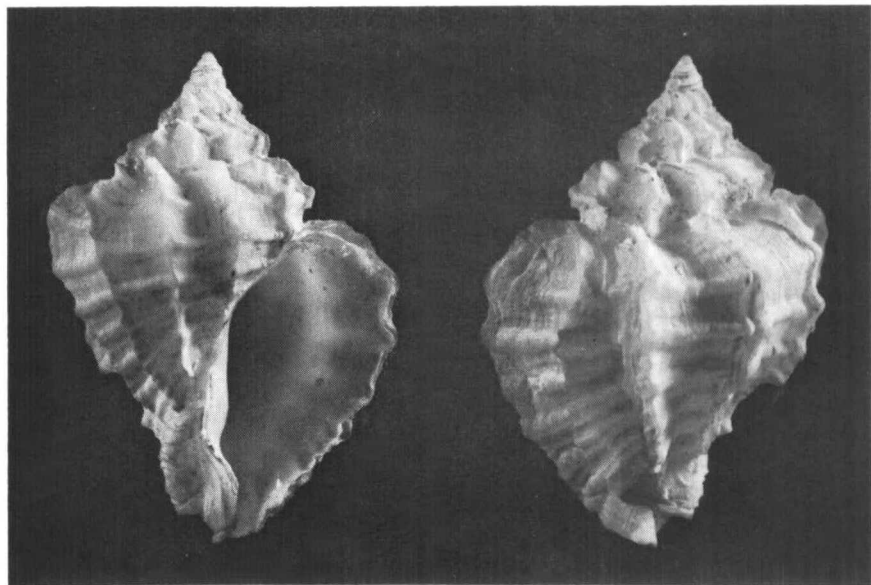


FIGURE 52. Coralliophilidae. *Coralliophila lactuca* Dall, Sta. G-179, length 10.4 mm.

Description.—See Dall, 1889a: 220.

Remarks.—This distinctive species seems to have been taken rather infrequently. Dall reported it from BLAKE station 5 off the coast of Cuba in 152-229 fathoms (= 274-412 meters), and from ALBATROSS station 2669 off Fernandina, Florida, in 352 fathoms (= 634 meters). It has been taken only twice in the exploratory work of R/V GERDA, both within the range established by Dall.

Family Buccinidae

44. *Phos beauii* Fischer & Bernardi

Fig. 53

Phos Beauii Fischer & Bernardi, 1860, J. Conchyliol., 5: 358, pl. 12, fig. 8-9 ("Marie-Galante. Trouvé sur les nasses des pêcheurs.").—Tryon, 1881, Man. Conch., 3: 219, pl. 84, fig. 533.

Phos Beauii, Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 178 (Barbados).

Record.—PILLSBURY Sta. P-875, off St. Vincent (13°10.2'N, 61°5.5'W, 105-183 m, one specimen, length 41.7 mm).

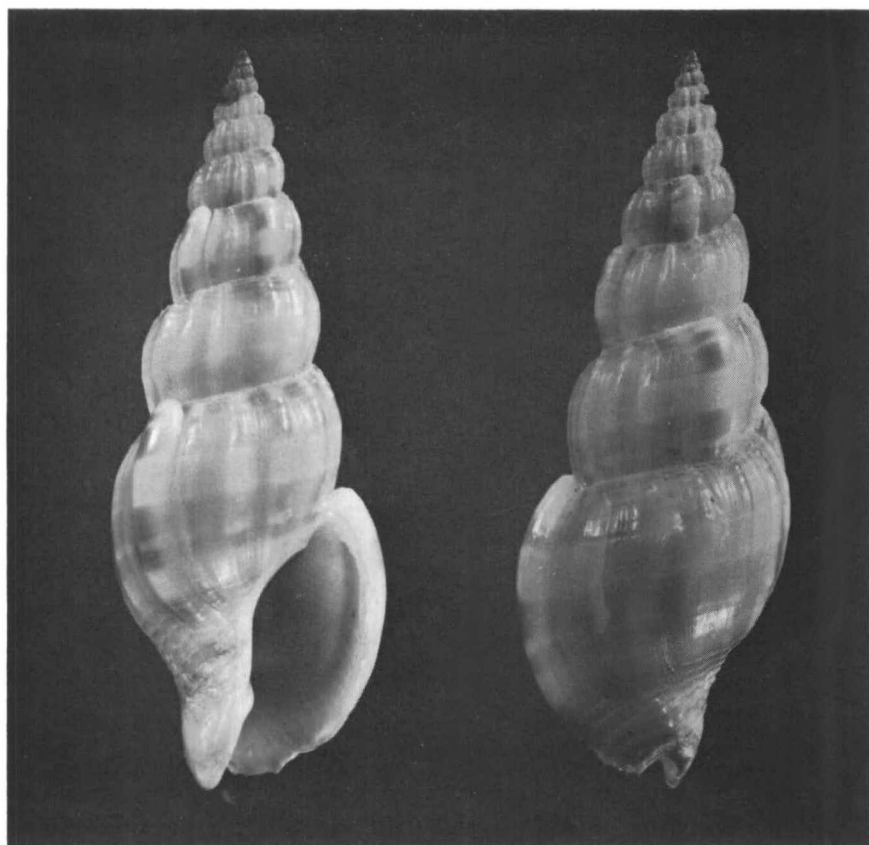


FIGURE 53. Buccinidae. *Phos beaulti* Fischer & Bernardi, Sta. P-875, length 41.7 mm.

Family Turbinellidae

Genus *Teramachia* Kuroda

Mesorhytis, Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 172.—Not Meek, 1876, Rep. U. S. Geol. Surv. Territories, 9: 356, 364 (type-species, *Fasciolaria? gracilentia* Meek).

Teramachia Kuroda, 1931, Venus, 3(1): 45-47 (type-species, *T. tibiaeformis* Kuroda, by monotypy).—Weaver & du Pont, 1970, Living Volutes: 176.

A living specimen of the peculiar gastropod called *Mesorhytis meekiana* by Dall and another belonging to a distinct but evidently related species were collected in the Caribbean Sea by R/V PILLSBURY. The fact that

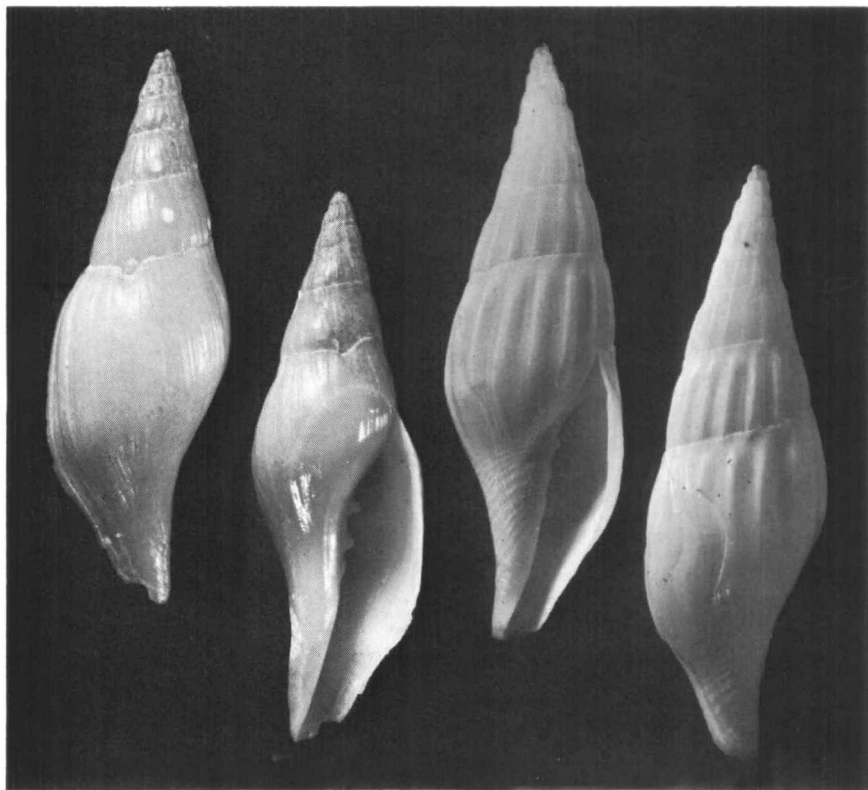


FIGURE 54. Turbinellidae. Left, *Teramachia meekiana* Dall, Sta. P-1225, length 26 mm; right, *Teramachia chaunax*, n. sp., Sta. P-904, holotype, length 28 mm.

only two specimens have been obtained over a period of more than six years from among thousands of gastropods trawled in the tropical western Atlantic during the Deep-Sea Biology Program of the Rosenstiel School of Marine and Atmospheric Sciences attests to their considerable rarity.

Dall (1889a) placed *Mesorhytis meekiana* in the family Fascioliariidae, but had neither operculum nor radula for guidance. However, comparison of specimens with *Teramachia barthelowi* (Bartsch) shows such close similarity of conchological characters of these two species that systematic relationship is suggested even in the absence of information about radular and opercular characters of the latter. These features in "*Mesorhytis*" *meekiana* are neither volutid nor fascioliariid, but indicate a closer affinity with the family Turbinellidae. Whether small shells such as *Teramachia*

barthelowi eventually will prove to be congeneric with larger forms such as *Teramachia tibiaeformis* Kuroda (the type-species) and *T. mirabilis* (Clench & Aguayo) (the type-species of *Howellia* Clench & Aguayo) must remain for future research to demonstrate. However, the striking similarity of *T. barthelowi* with "*Mesorhytis*" *meekiana*, here placed in the Turbinellidae, is sufficient evidence to assign them both to *Teramachia* along with the new species here described. *Mesorhytis costatus* Dall, 1890, is placed in the same genus on the basis of strong similarity of the shell.

45. *Teramachia meekiana* (Dall)

Figs. 54 (left); 55, D-E

Fasciolaria (*Mesorhytis*) *Meekiana* Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 172, pl. 36, fig. 7; 1889b, Bull. U. S. natn. Mus., 37: 112, pl. 36, fig. 7 (no descr.; fig. from 1889a).

Material Examined.—PILLSBURY Sta. P-1225, off SW coast of Jamaica (17°42.5'N, 77°58'W, 549-530 meters, 6 July 1970; one specimen).

Description.—This specimen conforms in all essential details with Dall's original material, consisting of dead but fresh specimens from three localities; the figured specimen is 15.5 mm long and 5.0 mm broad. The present specimen is 26.0 mm long and 8.2 mm broad, therefore possibly mature. The apex is lost and there are six remaining postnuclear whorls. Strong axial ribs are present on the second, third, and fourth whorls, becoming obsolete on the fifth. These whorls also show fine, spiral threads most distinct on the upper half, one of which is stronger than the rest. All fade away in the fifth whorl. The body whorl is somewhat more inflated than in Dall's illustrated specimen, the outer lip slightly flared and the anterior canal more distinctly recurved, features probably associated with maturity. The parietal wall has an extremely thin, inconspicuous glaze but is not callused. The columella is moderately flexuous, with three high, narrow, oblique plaits of which the posterior (upper) one is strongest.

The operculum (Fig. 55, E) is translucent corneous yellow, small, thin, and delicate. It is spatulate in shape, weakly curved, with nearly parallel sides. The nucleus is terminal, the apex truncated, perhaps because of wear; the muscle scar, at the opposite end, is almost circular.

The radula (Fig. 55, D) is triserial. The rachidian has three strong cusps on a bent basal plate. The laterals have a single flattened, curved, clawlike cusp arising terminally from an elongated base.

Syntypes.—USNM No. 86970. BLAKE Sta. 100, off Morro Light, Cuba, 400 fm. Two specimens.

Remarks.—The larger of two syntypes of *M. meekiana* Dall (USNM No. 86970), when compared with the type of *Prodallia barthelowi* Bartsch

(from ALBATROSS Sta. 5425 in the Sulu Sea off Cagayan I., 495 fm = 905 meters, USNM No. 238444), is smaller and not so strongly sculptured, and its columellar plications are higher and thinner. The axial sculpture of *P. barthelowi* is conspicuous and consists of sharply defined axial ribs separated by narrower deep channels. This sculpture fades out rather abruptly on the penultimate whorl, consequently the body whorl is smooth except for irregular growth marks. The three columellar plications are low but distinct, originating rather deep within the aperture so they are not conspicuous in direct apertural view. Perhaps it is this fact that caused Weaver & du Pont (1970: 177) to state that plications are absent, although they are visible in the photograph reproduced on their plate 75D.

The specimen from Sta. P-1225 is larger than Dall's specimens of *Mesorhytis meekiana* and is approximately the same size as the type of *Prodallia barthelowi*, differing from it in the same features. The conchological characters correspond so closely, however, that there can be little doubt that the two species are congeneric.

46. *Teramachia chaunax*, new species

Figs. 54 (right); 55, B-C

Description.—The shell is elongate fusiform, rather strong, smooth, white suffused with pale brown under a thin, olivaceous periostracum. Length of shell 28 mm, width 8.4 mm. Apex lost, eight postnuclear whorls remaining. Strong axial ribs on the spire, persisting on the body whorl but somewhat weaker there. Twelve axials on the first postnuclear whorl, increasing to 16 on the body whorl. Distinct axial growth lines are present in addition to the axial ribs. A single spiral cord below the suture, most distinct on the early whorls, producing a low nodule where it crosses each axial, thus giving the whorls a faintly shouldered aspect, growing indistinct on the body whorl. Outer lip simple, sharp; parietal wall smooth, not calused. Columella nearly straight, with three strong oblique plaits, the uppermost one strongest, forming deep within the aperture and scarcely visible from without. Anterior canal slightly produced, with about a dozen weak spiral threads.

The operculum (Fig. 55, C) is elongate, rather strongly curved, with terminal nucleus; the muscle scar is ovate and rather large.

The radula (Fig. 55, B) is triserial, as in *T. meekiana*, but the rachidian has a large, erect cusp with usually three denticles on each side. The laterals have a flattened, clawlike cusp at the end of an elongated base, as in *T. meekiana*.

Holotype.—USNM No. 701216, PILLSBURY Sta. P-904.

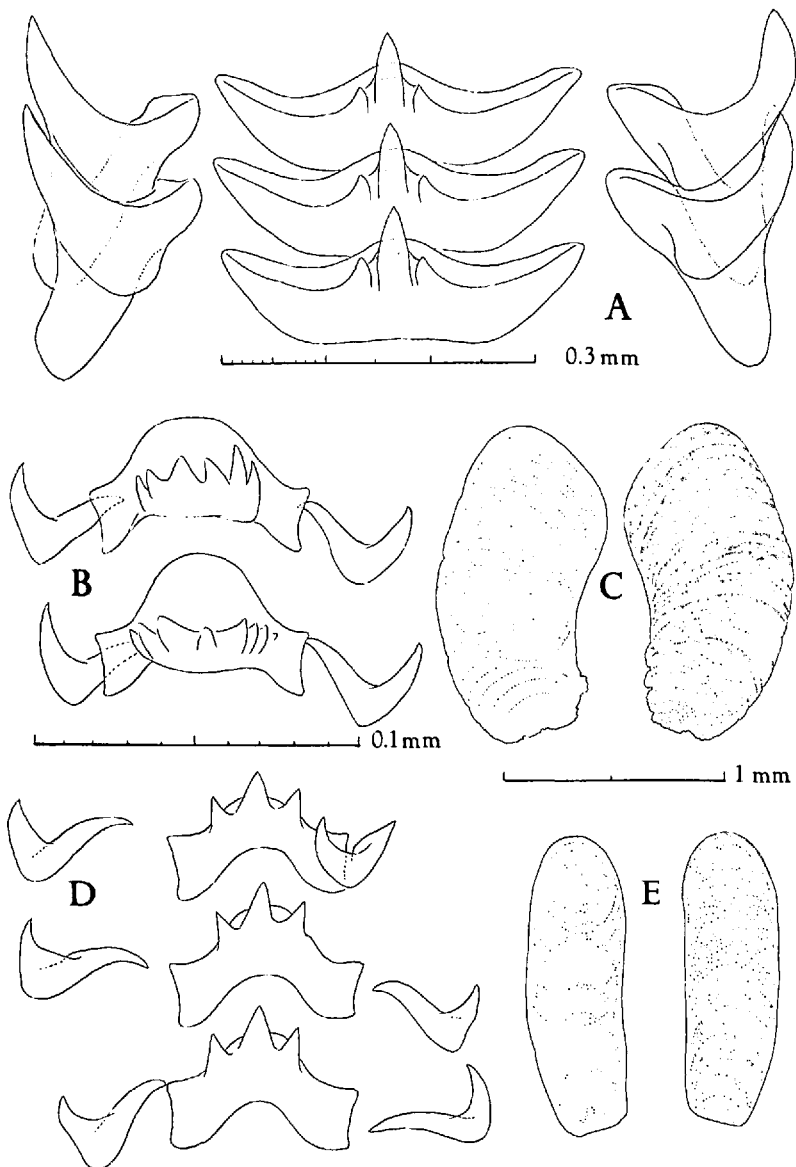


FIGURE 55. Turbinellidae. A, *Turbinella laevigata* Anton, OREGON Sta. 4240, radula; B, *Teramachia chaunax*, n. sp., Sta. P-904, radula; C, operculum of same; D, *Teramachia meekiana* Dall, Sta. P-1225, radula; E, operculum of same.

Type-Locality.—PILLSBURY Sta. P-904, W of St. Lucia ($13^{\circ}45.5'N$, $61^{\circ}05.7'W$, 201-589 meters, 9 July 1969).

Remarks.—This shell is very much like Dall's *M. meekiana* as originally described and figured, but differs in the persistence of the axial ribs on all whorls, the reduction of the subsutural spirals to a single cord at the shoulder, and the origin of the columellar plaits very deep in the aperture. The size of the aperture relative to the height is more like that of the original material of *M. meekiana*, which apparently was not adult, than that of the larger specimen from Sta. P-1225.

47. *Turbinella laevigata* Anton

Fig. 55, A

Turbinella laevigata Anton, 1839, Verzeichniss der Conchylien: 71.

Xancus laevigatus, Abbott, 1950, Johnsonia, 2(28): 207, pl. 91.

Record.—OREGON Sta. 4240, off coast of Maranhão State, Brazil, north of Tutoia: $2^{\circ}04'S$, $42^{\circ}05'W$, 49 meters, bottom temp. $83^{\circ}F$, 11 March 1963. Nine specimens.

Remarks.—The radula of this species is illustrated for comparison with those of *Vasum* and "*Mesorhytis*" (= *Teramachia*). As the species is so infrequently collected, the above locality record is reported.

48. *Vasum capitellum* (Linnaeus)

Fig. 56

Murex Capitellum Linnaeus, 1758, Syst. Nat., Ed. 10: 750.

Vasum (Altivasum) capitellum, Abbott, 1950, Johnsonia, 2(28): 214, pl. 94.

Vasum capitellum, Warmke & Abbott, 1961, Caribbean, Seashells: 121, pl. 22q.—de Jong & Kristensen, 1965, Correspondentieblad Ned. Malacol. Vereniging, Suppl. 1965: 39.

Vasum capitellum, Vokes, 1966, Tulane Stud. Geol., 5(1): 20 (synonymy).

—Work, 1969, Bull. Mar. Sci., 19(3): 675.

Material Examined.—PILLSBURY Sta. P-916, Guadeloupe ($16^{\circ}12.2'N$, $61^{\circ}26.3'W$, 2 m, 11 July 1969, two specimens).

Remarks.—This species is not common in collections and was taken only once by R/V PILLSBURY, at a shore station. As the operculum has not been figured and nothing seems to be known of the soft parts, the operculum and gross anatomy of the mantle cavity are illustrated in Figure 56.

Family Volutidae

Collections obtained by R/V GERDA and R/V PILLSBURY include members of the Volutinae, Lyriinae, Scaphellinae, and Volutomitrinae, and provide further evidence bearing upon classification in the family. The western Atlantic species of this family have been described and illustrated admirably

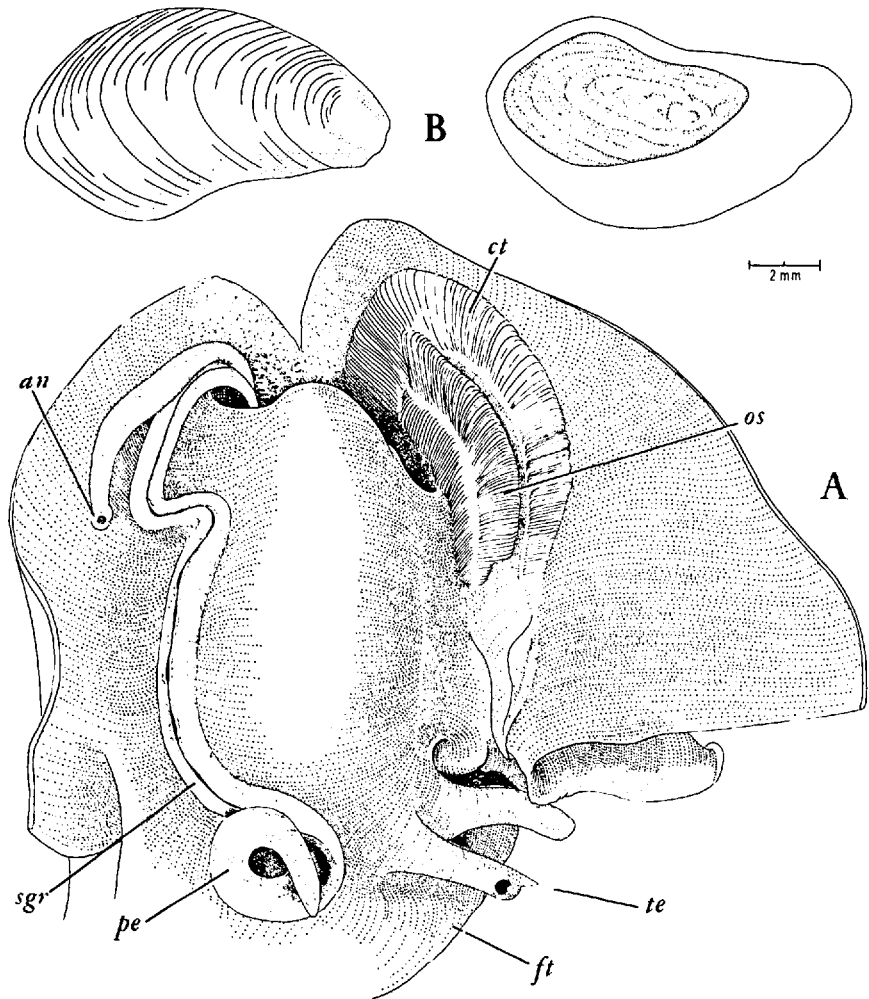


FIGURE 56. Turbinellidae. *Vasm capitellum*: A, gross anatomy of the mantle cavity of a specimen from PILLSBURY Sta. P-916; B, operculum. Drawing of operculum by Constance S. McSweeney. (an, anus; ct, ctenidium; ft, foot; os, osphradium; pe, penis; sgr, seminal groove; te, tentacle with eye.)

by Clench (1946, 1953) and Clench & Turner (1964, 1970). The classification of the family, still a difficult matter, has been considered by Pilsbry & Olsson (1953, 1954), who reviewed its history (1954).

The form of the radular teeth has been regarded as a fundamental char-

acter in subdividing the family Volutidae. It is hardly open to question that this is a sound concept, so long as the functional modifications that may occur in this structure are kept in mind.

It is difficult to relate, at first glance, the comblike rachidian plate of *Voluta* with the strongly modified tricuspid teeth of *Volutifusus*, *Aurinia* and *Odontocymbiola*, and the unicuspid teeth of *Scaphella*. However, intermediate stages can be seen even in the limited material examined in the present study, and these may be related to the development of specialized feeding habits.

The multicuspid rachidian is comblike in *Voluta musica* (Clench & Turner, 1964) but in *V. virescens* it shows a definite tendency toward a tricuspid condition by the clear emphasis of the middle as well as the two lateral cusps (Olsson, 1965, pl. 83, fig. 6a; Clench & Turner, 1970, pl. 173, fig. 4; and the present work, Fig. 60, B). This trend is continued in teeth such as those of *Lyria cordis*, in which the cusps between the central and lateral ones are reduced to denticles (Fig. 60, A). Loss of these denticles and increasing curvature of the basal plate would result in teeth such as those of *Zidona* (Clench & Turner, 1964, pl. 91) and *Aurinia* (Fig. 63, A). Reduction of the lateral denticles would result in teeth of the *Clenchina* and *Scaphella* types (Figs. 63, C; 63, B).

The extremely small size of the radulae in the Scaphellinae would apparently make the structure ineffective as a rasping organ, but the distinctly channeled cusp quite conceivably could serve to introduce venomous secretions into a prey animal. *Scaphella junonia* observed in the aquarium very quickly subdue their prey before transferring it to the pouch-like posterior end of the foot, in which it is kept (alive?) until it is eaten. The prominent cusp of *S. junonia* is conspicuously gutterlike.

The strongest suggestion that these kinds of teeth are assuming a fang-like function can be seen in the exceedingly small teeth of *Volutomitra*, in which the cusp is dartlike, sharply pointed, deeply channeled, and has very sharp edges. In these teeth, the basal shanks are strongly developed, apparently to provide greatest support for the dartlike cusp. This tooth form evidently has developed in somewhat the same way as has that of *Odontocymbiola* (see Clench & Turner, 1964, pl. 109; also Pilsbry & Olsson, 1954, pl. 4, figs. 6, 6a, 6b); published figures suggest that at least the central cusp may be channeled or hollow.

It is evident that studies of the feeding behavior of volutids are sorely needed as an aid toward understanding the evolution of radular form.

49. *Voluta virescens* Lightfoot Figs. 57; 60, B

Voluta virescens Lightfoot, 1786, Cat. Portland Mus., London: 26, No. 610.
—Olsson, 1965, Bull. Amer. Paleont., 49(224): 661, pl. 80, figs. 6-6a

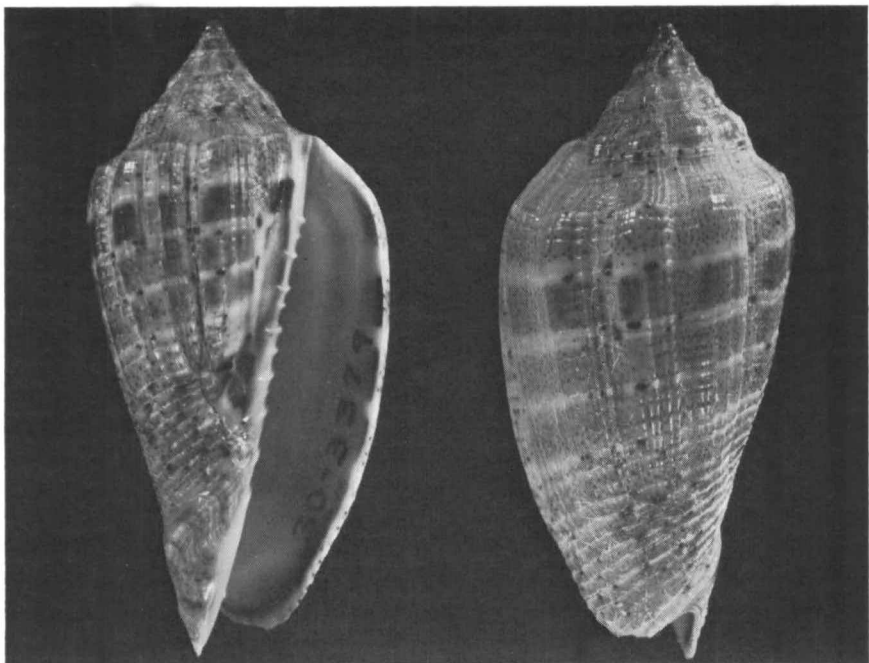


FIGURE 57. Volutidae. *Voluta virescens* Lightfoot, Sta. P-324, length 54.1 mm.

(type of *V. fulva* Lam.), 7-7a (*V. polyzonalis* Lam. from Lamarck's collection); pl. 81, figs. 1-1a (type of *V. polyzonalis* Lam.), 2-2a (specimen figured by Reeve, *Conch. Icon.*), 6 (fossil specimen); pl. 82, fig. 5 (spire of Recent specimen), 6 (spire of fossil specimen); pl. 83, figs. 1-1a, 2 (Recent specimens, Panama), 3 (fossil, Panama), 6-6a (radula).—Clench & Turner, 1970, *Johnsonia*, 4(48): 370, pl. 173, fig. 4 (radula).—Weaver & du Pont, 1970, *Living Volutes*: 7, pl. 1, figs. A, B.

Voluta? virescens, Clench & Turner, 1964, *Johnsonia*, 4(43): 146, pls. 82, 84.

This species, generally considered rare, was taken by R/V PILLSBURY at ten stations along the Caribbean coast of Panama and Colombia.

Records.—PILLSBURY stations P-324, Panama (9°44'N, 79°31'W, 64-65 m; 1 live specimen 54 mm long, 26 mm wide).—P-348, mouth of Gulf of Urabá (8°38.0'N, 77°02.2'W, 59 m; 1 live specimen 89.2 mm long, 42.7 mm wide).—P-367, Colombia (9°31.1'N, 75°49.6'W, 37-35 m; 2 small broken specimens, possibly preyed upon by some crustacean).—P-368, Colombia (9°31.2'N, 75°41.1'W, 37 m; six live specimens from 40.2 mm long, 18.2 mm wide, to 24.8 mm long, 12.8 mm wide).—P-370, Colombia

(9°37.9'N, 75°50.4'W, 37 m; one dead specimen 46.5 mm long, 23.5 mm wide; and 1 live specimen 32.3 mm long, 16.2 mm wide).—P-396, Colombia (9°18.2'N, 76°24.8'W, 70-68 m; one dead specimen 55 mm long, 25.8 mm wide).—P-397, Colombia (9°12.8'N, 76°27.1'W, 62-66 m; one dead specimen 28.7 mm long, 15.9 mm wide).—P-403, mouth of Gulf of Urabá (8°48.7'N, 77°12.7'W, 99-97 m, one live specimen 15 mm long, 8.4 mm wide).—P-412, Panama (8°38.9'N, 77°13.2'W, 55-60 m; one dead specimen 31.5 mm long, 15.4 mm wide).—P-434, Golfo de los Mosquitos, Panama (9°14.6'N, 80°21.8'W, 49-48 m; portion of body whorl of adult specimen).

Remarks.—The largest specimen (P-348, 89.2 mm long) is similar in size and shape to that illustrated by Reeve (Olsson, 1965, pl. 81, figs. 2-2a), which shows a tendency toward the growth form called *polyzonalis* Lam.; unfortunately, its shell is badly disfigured by scars from old shell damage and by the heavy blackish deposits commonly seen on mollusks in the southern Caribbean. The smallest example is a juvenile only 15 mm long, with four whorls not clearly divisible into nuclear and postnuclear turns; axial ridges begin weakly after a little more than two full turns and are strong on the fourth (last) whorl. The lot of six specimens from P-368, all young, contains both the strongly shouldered, low-spired form and the narrower, higher-spired form; color and sculpture are identical.

The radula of a young animal from P-368 (Fig. 60, B) agrees more closely with the figure given by Olsson (1965) than with that of Clench & Turner (1970). It is composed of 50 teeth (the last two incompletely formed) 0.24 mm wide. The central and terminal cusps are stronger than the others, showing a trend toward the tricuspid condition of the Scaphellinae. A possible intermediate stage is seen in the teeth of *Lyria cordis*, n. sp., in which the cusps separating the central and terminal ones are reduced to small denticles (Fig. 60, A).

Genus *Lyria* Gray

Subgenus **Cordilyria**, new subgenus

Diagnosis.—Shell smooth, scaphelliform, axial sculpture developed on early whorls but becoming obsolete toward the body whorl; columella with three strong plaits followed by conspicuous lirations on the parietal wall. Radula conspicuously tricuspid, interspaces between cusps denticulate. Operculum well developed, nucleus apical.

Type-Species.—*Lyria (Cordilyria) cordis*, new species, here designated.

50. ***Lyria (Cordilyria) cordis***, new species

Figs. 58; 59; 60, A; 61

Description.—Shell ovately fusiform, smooth and glossy but not highly polished. Anterior canal weakly produced, the small sinus forming a fas-

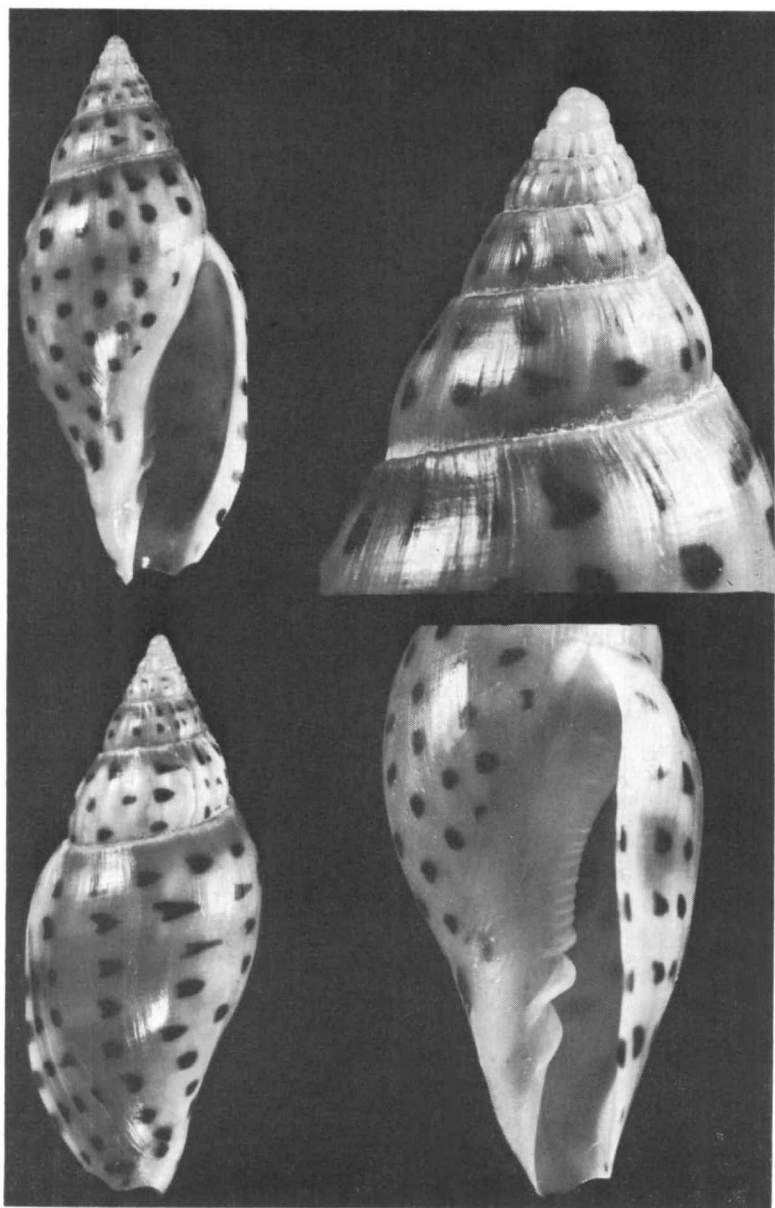


FIGURE 58. Volutidae. *Lyria cordis*, n. sp., holotype, Sta. P-1303, length 42.5 mm.

ciole indicated chiefly by direction of growth lines and slightly paler color, not distinctly bounded by any sculptural cord or ridge. Length 42.5 mm; maximum diameter 18 mm; length of body whorl 27 mm. Whorls seven, of which $1\frac{1}{2}$ compose the small, smooth protoconch, which is not sharply distinguished from the postnuclear whorls; the following $2\frac{1}{2}$ whorls sculptured by low, rounded axial undulations which slowly diminish on the next two whorls, until the body whorl becomes quite smooth, marked only by microscopic axial growth lines. Spiral sculpture virtually nonexistent, the postnuclear whorls showing only the faintest indication of widely spaced spiral striation. Outer lip slightly thickened, not denticulate within. Columella with three prominent folds, the middle one strongest, the posterior one weakest; parietal wall with 12 narrow, raised ridges, the anterior ones much weaker than the adjacent columellar fold, the posterior ones very faint.

Ground color vinaceous tan, suture with a diffuse pale spiral line, faint indication of a pale spiral band below the suture, another below the middle of the body whorl, and one along the fasciole. A color pattern of reddish brown spots begins about the third whorl, becoming more distinct on the succeeding whorls; body whorl with eight spiral rows of bilobed, heart-shaped, or squarish spots arranged in axial rows not strictly conforming with the contour of the lip. Four marginal spots clearly visible through the edge of the lip and a fifth (the anteriormost) less distinctly so. A small area of whitish callus lies adjacent to the posterior angle of the aperture; parietal area without color pattern, as if the outermost layer of shell has been planed off by the advancing edge of the mantle. This color pattern results in a shell resembling a small *Scaphella* or a spotted *Aurinia*.

The gross external features of the soft parts agree with the description of those of *Voluta* given by Clench & Turner (1964). The siphon has a pair of unequal basal lobes, the left one the larger. The head is strongly flattened, with a broad frontal lobe lying between the tentacles. The tentacles are flattened, tapering, the right one broader than the left. A broad lateral lobe lies on each side of the head behind the tentacles, the right one larger than the left. The eyes are situated near the anterior margin of the lateral cephalic lobes near their junction with the tentacles. The broad, flattened proboscis extends from beneath the frontal lobe. The operculum is situated on a prominent opercular pad on the dorsal side of the foot near its posterior end.

The color of the living animal is shown in Figure 59.

The uniserial radula has a tricuspid rachidian with a series of small, but distinct, denticulations between the cusps (Fig. 60, A).

Holotype.—USNM No. 700000, from PILLSBURY Sta. P-1303.

Paratype.—USNM No. 700001, from the same station.

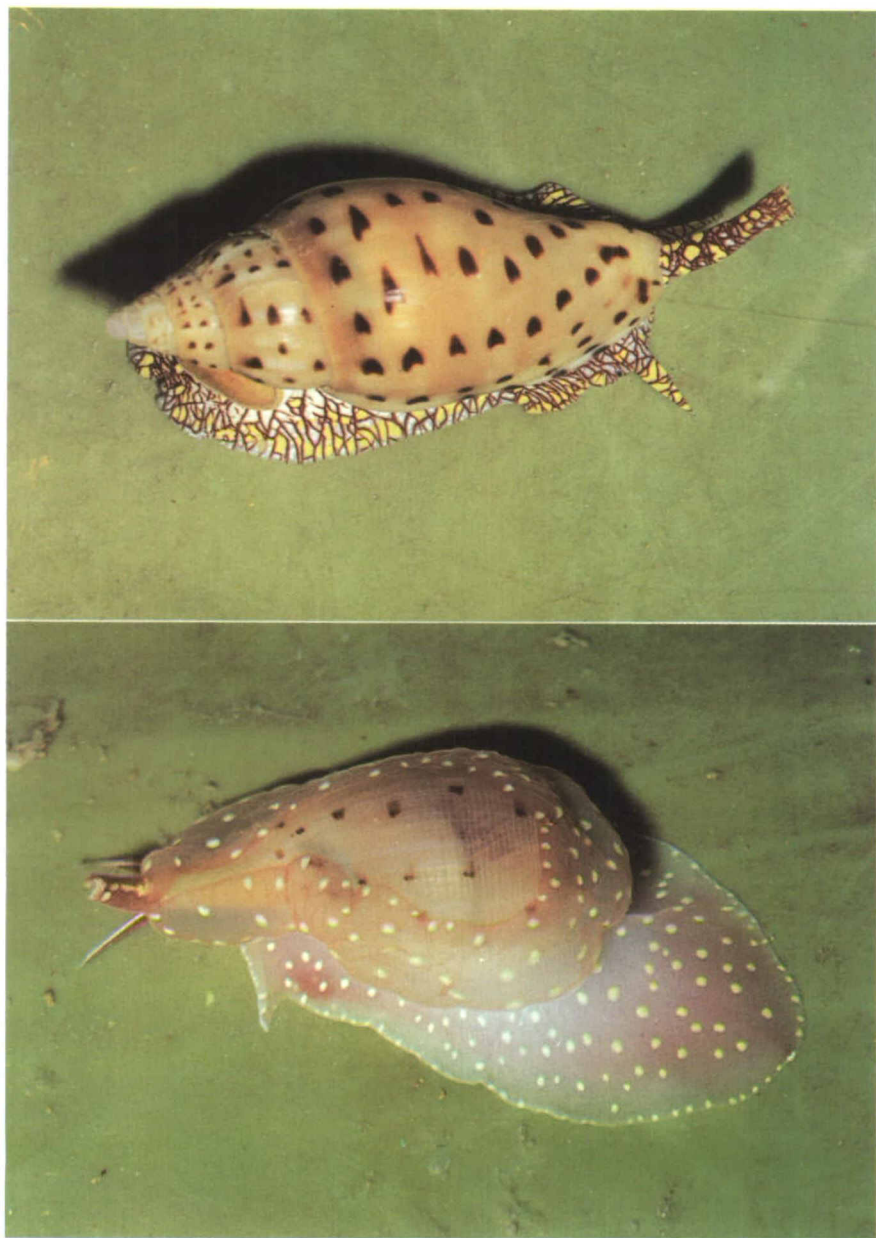


FIGURE 59. Living animals of *Lyria cordis*, n. sp. (above) and *Ficus howelli* Clench & Aguayo (below). Photographs by Dennis M. Opresko.

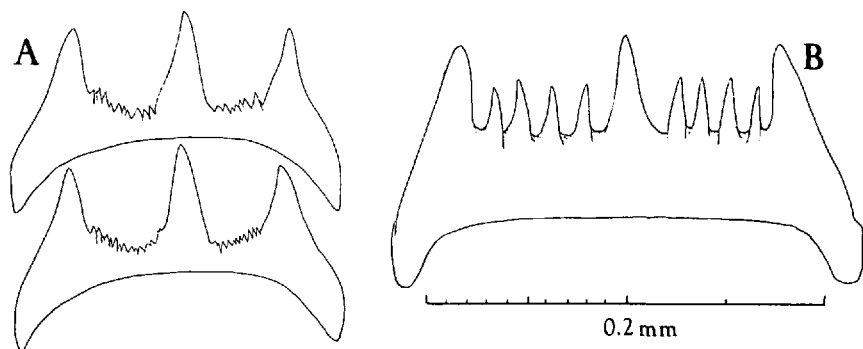


FIGURE 60. Radulae: A, *Lyria cordis*, n. sp.; B, *Voluta virescens* Lightfoot.

Type-Locality.—PILLSBURY Sta. P-1303, Caribbean Sea, 20 miles ESE of Sto. Domingo, island of Hispaniola, 18°21.0'N, 69°14.3'W, depth 174 m, 21 July 1970.

Remarks.—By its smooth shell, *Lyria cordis* resembles *Lyria* (s.s.) *vegai* Clench & Turner, 1967, also from Hispaniola, but its coloration and shape differ markedly. The aperture is longer and narrower, occupying 64 per cent of the total length in contrast to 56 per cent in *L. vegai* (calculated from published photograph), resulting in a more “scaphelloid” shape. This *Scaphella*-like appearance is accentuated by the color pattern of reddish brown spots arranged in regular spiral rows. The columella has three well-developed plications and a dozen parietal ridges, compared with two strong and one weak plication and only three or four parietal ridges in *L. vegai*. *L. cordis* has a smaller shell, evidently maturing at a little over 40 mm rather than reaching 60 mm as in *L. vegai*. In its general shape, *Lyria cordis* seems to approach *L. beaulti* (as figured by Fischer & Bernardi, reproduced by Clench & Turner, 1967: figs. 2-3) more closely than does *L. vegai*, but Fischer & Bernardi's figure seems to be a little misleading as shown by modern colored photographs (Dance, 1969: 96, pl. 16c). *Lyria cordis* lacks axial costae on the later whorls.

The radula of *L. vegai* is unknown, but those of *L. beaulti* (Tryon, 1882: 101, pl. 2, fig. 7) and of the Indo-Pacific *L. mitraeformis* Lamarck and *L. quecketti* Smith (Cooke, 1922: 9, figs. 5, 6) lack denticles between the cusps, a feature that sets *L. cordis* apart from all other species of *Lyria* whose radulae have been described.

The discovery within a relatively short time of two very showy new species from the same geographical region is another indication of our very incomplete knowledge of the Caribbean molluscan fauna.

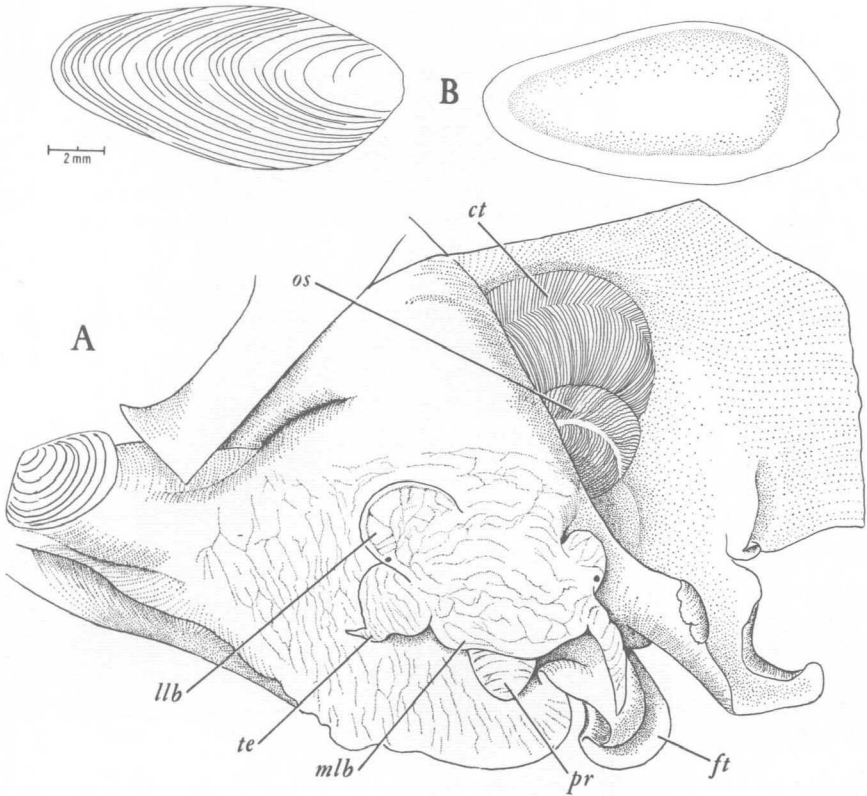


FIGURE 61. Volutidae. *Lyria cordis*, n. sp.: A, gross anatomy of the mantle cavity; B, operculum. Drawing of operculum by Constance S. McSweeney. (ct, ctenidium; ft, foot; llb, lateral lobe of head; mlb, median lobe of head; os, osphradium; pr, proboscis; te, tentacle.)

Genus *Scaphella* Swainson, 1832

Pilsbry & Olsson (1953) realigned the species of the subfamily Scaphellinae on the basis of radular characters, clearly distinguishing three types of rachidian teeth: (1) those with a single long, concave cusp and no small basal denticles (genus *Scaphella*); (2) those with a shorter, more pointed, concave cusp flanked by minute accessory cusps (genus *Clenchina*); and (3) those with a well-developed lateral cusp on each side of the main, central cusp (genera *Aurinia* and *Volutifusus* = *Bathyaurnia*). Those authors observed that the accessory cusps in *Clenchina* are the sharply pointed ends of the two ridges along the sides of the basal shanks of the tooth.

Careful examination of the teeth of *Scaphella junonia* shows that the ends of the lateral ridges of the shanks are produced as inconspicuous rounded "shoulders" at the base of the cusp, so the accessory denticles are present, although in a reduced condition, also in *Scaphella junonia*. It appears, therefore, that the teeth in this subfamily show a progressive reduction of the lateral denticles from the strongly tricuspid condition of *Aurinia* to the simple Y-shape in *Scaphella*, where the lateral denticles have nearly disappeared. This fact, together with the similarity of conchological characters, seems to justify recognition of the groups established by Pilsbry & Olsson at the subgeneric rather than the generic level. The differences are small, and information about the radulae of more species may well erase the distinctions altogether.

51. *Scaphella (Scaphella) junonia* (Lamarck)

Figs. 62; 63, B

Voluta junonia Lamarck, 1804, Ann. Mus. natn. d'Hist. Nat., 5: 156.

Scaphella (Scaphella) junonia, Clench, 1946, Johnsonia, 2(22): 49, pl. 28, figs. 1-3 (synonymy).—Clench & Turner, 1970, Johnsonia, 4(48): 371 (revised distribution).—Weaver & du Pont, 1970, Living Volutes: 140, figs. 31a, 31b; pl. 57 E-H.

Record.—GERDA Sta. G-767. Straits of Florida, SSE of Carysfort Reef Lighthouse: 25°13'N, 80°10'W, 108-88 meters, 26 January 1966, one specimen, length 98.5 mm, width 39 mm at time of capture; length 107.4 mm, width 46.5 mm on June 5, 1967, after 16 months in the aquarium.

Range.—North Carolina southward to the Straits of Florida; Gulf of Mexico, including the Bay of Campeche, to Arrowsmith Bank, Yucatan.

Remarks.—The radular teeth of the specimen from Sta. G-767 (Fig. 63, B) agree with the figures given by Pilsbry & Olsson (1953: figs. 1, 1a; 1954: pl. 3, figs. 14, 14a), but not with that of Clench (1946: pl. 24, fig. 4), which shows the basal shanks extending back almost parallel from the long, straight cusp.

This specimen was maintained alive in running seawater at the institute for a period of 16 months by Mr. Robert C. Work. During this period, the animal added 29 mm to the margin of the shell, resulting in an increase in length of almost 10 mm and in maximal width of over 7 mm. The spots on the new part of the shell are more intensely colored, and those in four of the spiral rows subdivided into two rows each (Fig. 62). This shows that environmental factors can influence the number of rows, size, and color of the spots and suggests that nominal subspecies such as *S. junonia butleri* Clench and *S. junonia johnstonae* Clench are localized populations whose color characters are influenced by ecological conditions. The fol-

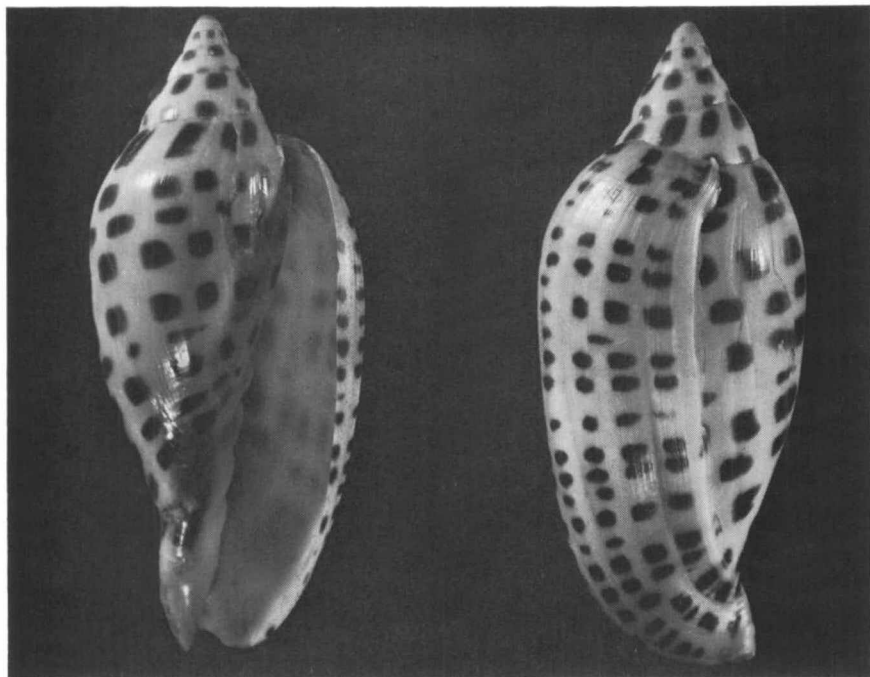


FIGURE 62. Volutidae. *Scaphella junonia* (Lamarck), Sta. G-767, length 107.4 mm.

lowing observations on the activities of this animal were generously provided by Mr. Work:

Very soon after its release on a water-table, the junonia pursued and captured a naticid that had been taken in the same dredge haul. The prey was completely and tightly enfolded by the posterior portion of the foot, which appeared to form a deep pouch opening to the outside only through a single ventral, anterior slit. The junonia then curled its anterior portion ventrally and posteriorly, bringing its head very near the entrance to the pseudopouch formed by its foot. As the victim was thought to be an undescribed species, it was rescued immediately and showed no ill effects from the attack.

During the subsequent 28 days, the junonia made no further attempt to capture prey, even though specimens of many different genera of gastropods and pelecypods, as well as other invertebrates, were freely available. On the 29th day of its captivity, living specimens of *Oliva sayana* and *Cancellaria reticulata* were released on the water table with the junonia. It promptly attacked a large olive, repeating the method of enfoldment that had been employed with the naticid. The olive shell was enfolded with its long axis at right angles to the longitudinal axis of the junonia's foot, so that the pouch protruded laterally beyond the usual width of the foot.

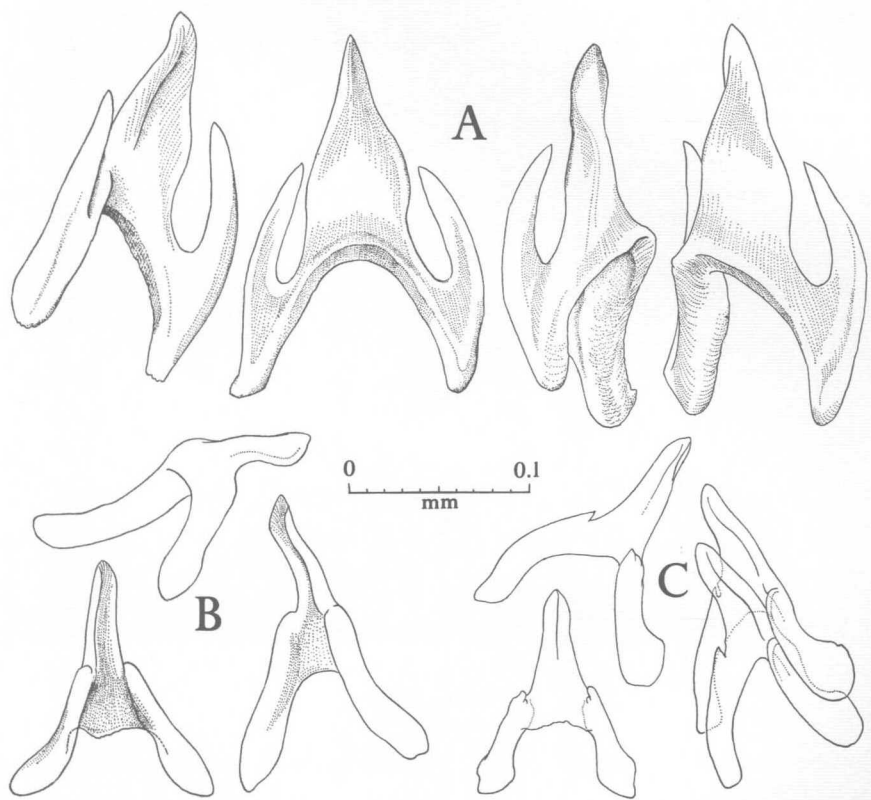


FIGURE 63. Radular teeth: A, *Scaphella (Aurinia) dubia*; B, *Scaphella (Scaphella) junonia*; C, *Scaphella (Clenchina) evelina*, n. sp.

In subsequent attacks on *Oliva*, the prey was always held in the same manner. The junonia then lay on its side and inserted its head into the pouch for a short time, after which the olive no longer showed any indication of struggle. The junonia then dragged its victim around the water-table for several hours, making no attempt to eat it. The olive was then retrieved, and appeared to be dead but completely intact. It was then replaced near the junonia, which immediately enfolded it and resumed dragging it. Subsequent retrieval of the olive showed that a large portion of the soft parts had been eaten. The same olive was again accepted by the junonia and dragged around the water-table for a period of at least eight hours and possibly much longer into the night. The next morning, the junonia was found attacking a specimen of *Cancellaria*. This animal also appeared to be stunned or dead and was dragged about for a long period before it was eaten. For several more months the junonia was kept on the water-table,

where it regularly attacked and dragged olives about, intermittently stopping to feed on its prey "in storage."

As the shallow sand of the water table was insufficient for the junonia to burrow deeply, it is possible that this was the reason it dragged its prey for long periods. When the animal later was placed in a large tank with deeper sand, where it remained until it was preserved more than a year later, it captured and devoured all of its prey beneath the surface of the sand, making accurate observation impossible. A constant supply of *Oliva* was maintained in the tank. During the entire period of captivity, only *Oliva*, *Cancellaria* and *Natica* were attacked by the junonia.

52. *Scaphella (Aurinia) dubia* (Broderip, 1827)

Fig. 63, A

Voluta dubia Broderip, 1827, Zool. Jour., 3: 81, pl. 3, fig. 1.

Scaphella (Aurinia) dubia, Clench, 1946, Johnsonia, 2(22): 54, pl. 30, figs. 1-2 (synonymy).—Weaver & du Pont, 1970, Living Volutes: 144, pl. 29, figs. C, D.

Record.—GERDA Sta. G-462. Straits of Florida, SE of Dry Tortugas (24°20'N, 82°46'W, 174-201 meters, 25 January 1965, two specimens, length 68 mm, width 23.4 mm; length 70.4 mm, width 21.7 mm).

Range.—Gulf of Mexico and lower Straits of Florida.

Remarks.—This record of the type-species of *Aurinia* is introduced for comparison of the radular teeth with those of *Scaphella (Clenchina) evelina*, n. sp., and of *Scaphella (s.s.) junonia* (Lamarck).

53. *Scaphella (Clenchina) evelina*, new species

Figs. 63, C; 64

Material Examined.—PILLSBURY Sta. P-394, Caribbean Sea, off Isla Fuerte, Colombia (9°28.6'N, 76°26.3'W, 421-641 meters, 16 July 1966; one live specimen, length 91.6 mm, width 34.8 mm).—P-399, Caribbean Sea, NE of Punta Caribana, Colombia (9°01.3'N, 76°40.2'W, 119-179 meters, 17 July 1966; large fragment of columella and body whorl of large specimen).—P-444, Caribbean Sea, Golfo de los Mosquitos, Panama (8°57.5'N, 81°31.0'W, 73 m, 21 July 1966; one dead specimen, length 110.9 mm, width 42.5 mm).—P-797, Caribbean Sea, off Cartagena, Colombia (10°21.9'N, 75°47.3'W, 170-150 m, 1 August 1968; one dead specimen, juvenile, length 23.8 mm, width 11.2 mm).—OREGON Sta. 3587, Caribbean coast of Panama (9°18'N, 80°25'W, 137 m, 29 May 1962; one dead and broken specimen, length 181 mm, width 76 mm).

Description.—Shell large, fusiform, first three postnuclear whorls thick and solid, but shell becoming thinner with increasing size; body whorl of mature shells thin and delicate, rather inflated when fully grown. Whorls six,

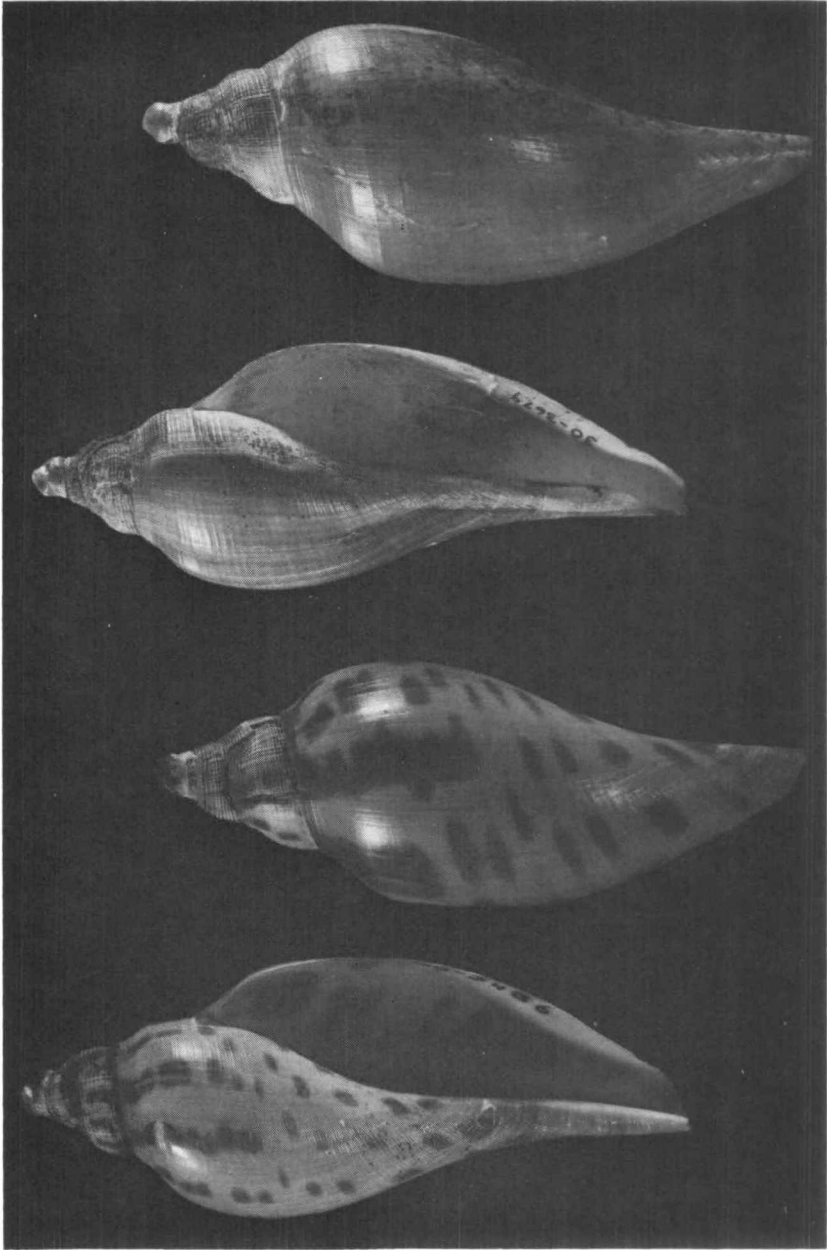


FIGURE 64. Volutidae. *Scaphella evelina*, n. sp.: left, holotype, Sta. P-394, length 91.6 mm; right, paratype, Sta. P-445, length 110.9 mm.

weakly shouldered from the third postnuclear turn onward, with a faintly concave slope above the rounded shoulder. Spire acute, moderately extended, suture moderately impressed. Aperture elongate-elliptical, narrowed above and more so toward the siphonal canal. Outer lip thin and fragile, parietal wall thinly glazed. Columella weakly arched, with two weak plications visible deep within the aperture (juvenile of only two post-nuclear whorls with three plications, suggesting that the anterior one progressively weakens and ultimately forms the columellar edge of the anterior canal). Siphonal canal broad, gently tapered, only little arched dorsally. Nuclear whorl smooth; first postnuclear whorl developing spiral cords which become strong in the second whorl, where weakly curved axial cords appear, producing a distinct beading where they intersect with the spirals; axial riblets becoming about as strong as the spiral cords in the third post-nuclear whorl, so the sculpture appears cancellate; after third whorl, sculpture weakening, the axials regressing to microscopic growth lines, the spirals scarcely perceptible; surface of body whorl macroscopically smooth. Color of nuclear whorl brown; ground color of postnuclear whorls pinkish brown or mahogany brown, with faint, irregular axial streaks; one example with about 12 spiral rows of spirally elongated mahogany brown spots showing a tendency to fuse axially into irregular dark streaks; juvenile of two post-nuclear whorls with eight spiral rows of distinct squarish brown spots.

Holotype.—USNM No. 701217, from PILLSBURY Sta. P-394.

Paratypes.—All remaining material; from PILLSBURY Stas. P-399, P-444, P-797, and OREGON Sta. 3587.

Type-Locality.—Caribbean Sea off Isla Fuerte, Colombia, at PILLSBURY Sta. P-394 (9°28.6'N, 76°26.3'W, in 421-641 meters).

Range.—Southwestern part of the Caribbean Sea, at depths between 77 and 641 meters.

Remarks.—This species is distinguished by the cancellate sculpture, produced by the intersection of spiral and axial cords on the first three post-nuclear whorls, which fades out to a smooth surface on the body whorl; by its large size, thin structure and, when fully developed, inflated body whorl; and by its coloration. It seems very probable that the uniform brown phase results from fusion of the dark blotches. The close similarity of shell characters in all specimens indicates that only a single species is involved here.

The cancellate sculpture on the spire resembles the condition in *Scaphella junonia* (Lamarck) and *S. floridana* (Heilprin), in which, however, it does not persist to so late a stage in the development of the postembryonic shell (Pilsbry & Olsson, 1954, pl. 1, figs. 5, 9). This conchological relationship

is further reinforced by the close similarity of the radular teeth of *S. evelina*, n. sp. (Fig. 63, C) with those of *S. junonia* as illustrated by Pilsbry & Olsson (1953) and Pilsbry & Olsson (1954), and confirmed by material collected by R/V GERDA (Fig. 63, B). The most conspicuous difference is the presence of a small, sharp denticle on each side of the base of the large central cusp, in which it agrees with species of *Clenchina* Pilsbry & Olsson. As indicated above, this genus is here treated as a subgenus of *Scaphella*.

Genus *Volutomitra* (Gray Ms.) H. & A. Adams

Volutomitra Gray, in H. & A. Adams, 1853, Gen. Rec. Moll., 1: 172.—Gray, 1857, Guide: 36.—Tryon, 1882, Man. Conch., 4: 108, 124.—Dall, 1889a, Bull. Mus. comp. Zool. Harv., 18: 145.

Diagnosis.—Shells of moderate size, fusiform, smooth or weakly sculptured, with thin, smooth periostracum; aperture narrow, without siphonal notch and fasciole, outer lip simple, sometimes with a slight thickening upon full development. Radula extremely small, with a scaphelloid rachidian having flattened shanks and a sharp, guttered cusp; laterals minute, sliver-like (sometimes absent entirely?). No operculum.

Type-Species.—*Volutomitra groenlandica* (Beck) by subsequent designation: Tryon, 1882: 124, pl. 2, fig. 8 (radula) and pl. 36, fig. 83 (shell); also Dall, 1889a: 145, pl. 34, figs. 6-7.

Remarks.—The subfamily Volutomitrinae was omitted from the family Volutidae by Weaver & du Pont (1970). However, the form of the rachidian tooth, similar to that of *Amoria* (see Weaver & du Pont, 1970: 147-167), speaks strongly for its inclusion in the family, perhaps even in the subfamily Scaphellinae. Although the vestigial lateral teeth are so small as to be easily overlooked, and may indeed be lacking in some cases, the triserial radula is sufficient grounds for retention of the subfamily Volutomitrinae, at least provisionally.

It should be restated that the figure of the radula of *V. groenlandica* showing broad, platelike laterals, reproduced by Tryon (1882) from Troschel, undoubtedly represents the detachment of the shanks from the cusps by excessive flattening under the coverslip (Cooke, 1922: 10).

54. *Volutomitra persephone*, new species

Figs. 65; 67, A-C

Material Examined.—PILLSBURY Sta. P-447, Golfo de los Mosquitos, Panama (9°07.4'N, 81°07.4'W, 664-681 m, 21 July 1966; four specimens).—P-741, off Los Roques, Venezuela (11°47.8'N, 66°06.8'W, 1052-1067 m, 23 July 1968; one dead shell).—P-754, off Pta. Zamuro, Venezuela (11°36.9'N, 68°42'W, 684-1574 m, 26 July 1968; five specimens).

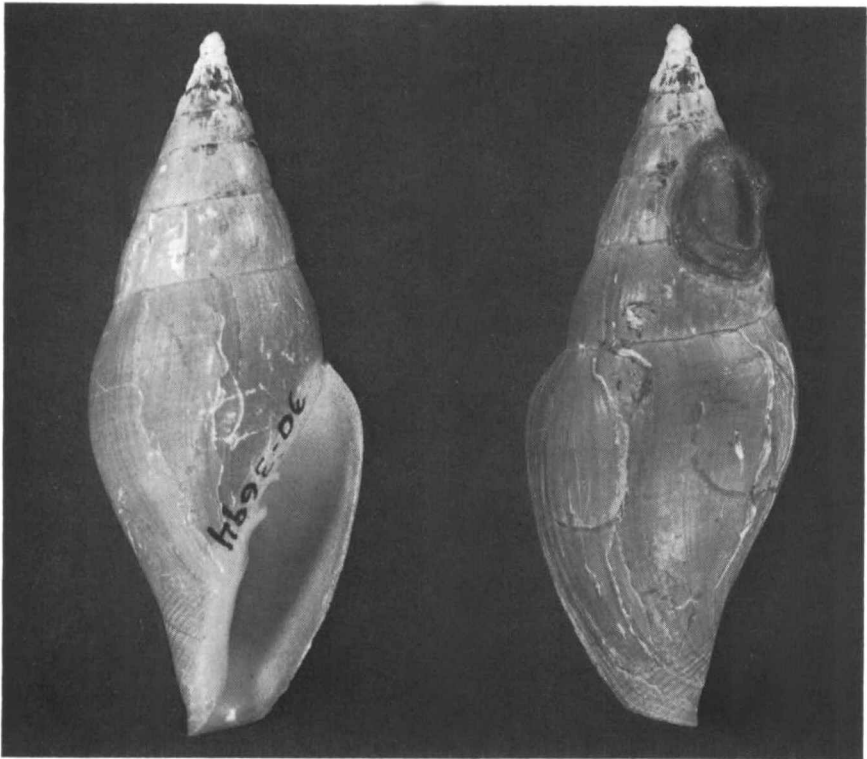


FIGURE 65. Volutidae. *Volutomitra persephone*, n. sp., holotype, Sta. P-447, length 40.7 mm.

Description.—Shell of moderate size, porcellaneous white under a thin, smooth, olivaceous periostracum, fusiform, with spire elevated; siphonal canal scarcely produced and slightly flared anteriorly. Whorls ten, spire flatsided, suture little impressed. Aperture narrowly elliptical. Outer lip thin and smooth, its edge faintly reflected. Parietal wall with a narrow glazed area; columella only slightly arched, with four plications of which the anteriormost is weakest and not visible from outside. The other three plications, visible in the aperture, moderately strong; the middle one strongest, the posterior (uppermost) one next, and the anterior one (i.e., the third from above) least so. No siphonal fasciole. Nucleus apparently of about one whorl, but the eroded surface does not reveal the boundary with postnuclear whorls. Areas having intact surface show narrow, semi-lunate axial ribs beginning in the second whorl and persisting into the fifth where they become obsolete and disappear. Axial growth lines micro-

scopically fine. No evident spiral sculpture on the spire, but there is a subtle hint of spiral lines possibly confined to the periostracum; these continue on the body whorl where, toward the base, they strengthen to form about 15 slightly raised, flattened, spiral cords that become evident opposite the second (i.e., the strongest) columellar plication.

No operculum. Radula small, with rachidian of generally scaphelloid nature, having a cusp (the "mesocone") resembling a pointed, V-shaped trowel blade (Fig. 67, A). No laterals clearly detectable, but the edge of the ribbon has oblique refractive lines that could represent scars from which laterals have been detached or extremely delicate laterals, *per se*. These are precisely as drawn by William Stimpson for *Volutomitra groelandica* in the figure reproduced by Dall (1889a: pl. 34, fig. 7).

Measurements.—Length 40.7 mm, width 16.1 mm (holotype); length 39.3 mm, width 16.1 mm (paratype, broken shell); length 38.7 mm, width 15.1 mm (paratype, live shell); length 37 mm, width 14 mm (paratype, broken shell); and six smaller paratypes from 11.1 to 19 mm in length.

Holotype.—USNM No. 701218, from PILLSBURY Sta. P-447.

Type-Locality.—P-447, Golfo de los Mosquitos, Panama (9°07.4'N, 81°07.4'W, in 664-681 meters).

Remarks.—The spire of the type-specimen bears a hemispherical leathery egg capsule, possibly belonging to this species, and evidence of the former attachment of two others.

The small specimens from stations P-741 and P-754, ranging from 11 to 19 mm in length, are not separable from the larger individuals on any radular or conchological characters, and therefore are retained within this species.

These shells have a striking resemblance to *Volutomitra alaskana* Dall (1921: 87, pl. 11, fig. 3) in size, shape, and general appearance. The chief differences are the more produced anterior canal and the weaker anterior columellar plication in *V. persephone*.

55. *Volutomitra erebus*, new species

Figs. 66; 67, D-J

Material Examined.—PILLSBURY Sta. P-478, SW of Grenada (11°34.4'N, 62°10.7'W, 598-597 m, 2 August 1966; one specimen).—P-776, N of Guajira Peninsula, Colombia (12°13.3'N, 72°50'W, 408-576 m, 29 July 1968, two specimens).—P-781, N coast of Colombia (11°30.1'N, 73°26.5'W, 567-531 m, 30 July 1968, four specimens).

Description.—Shell of moderate size, porcellaneous white under a thin, smooth, pale olivaceous periostracum, with elevated spire; siphonal canal

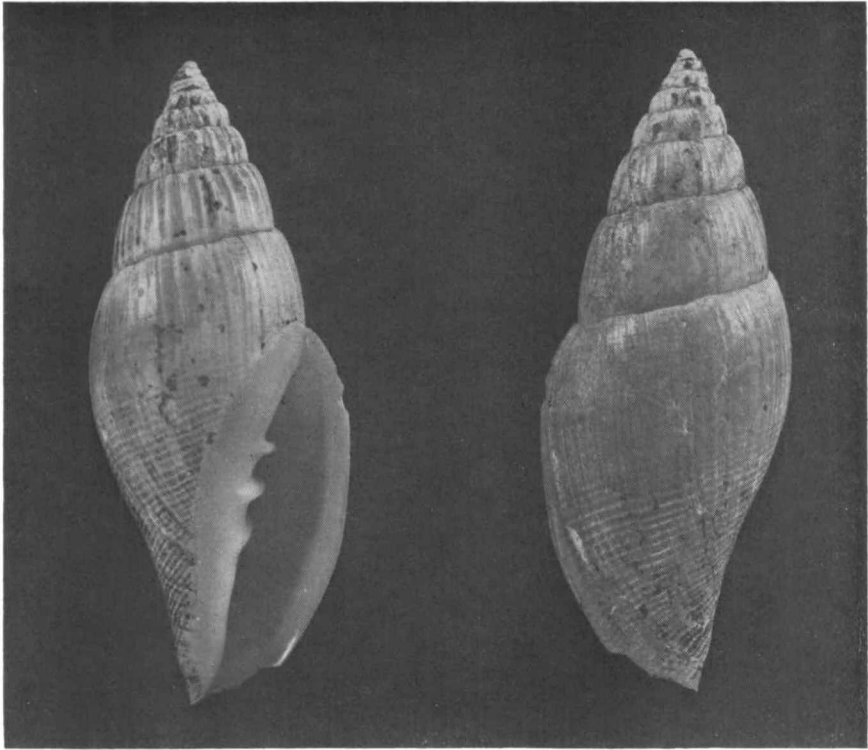


FIGURE 66. Volutidae. *Volutomitra erebus*, n. sp., holotype, Sta. P-776, length 35.6 mm.

slightly produced, weakly flared anteriorly. Whorls nine, sides of spire somewhat convex, whorls slightly inflated, suture impressed. Aperture narrowly elliptical. Outer lip simple, smooth, somewhat thickened and a little reflected in the adult. Parietal wall with a moderately wide glazed area; columella almost straight, with three distinct plications, of which the lowest is slightly weaker, followed by a weak low ridge not visible from outside and only faintly discernible deep within the aperture. Nucleus apparently of one whorl, but apex eroded so that its limits, and the place of initiation of sculpture, cannot be seen. Axial ribs clearly present in the third and subsequent whorls, persisting onto the penultimate whorl and becoming obsolete but detectable on the body whorl. Axial growth-lines microscopic. Weak spiral lines microscopically visible on spire; lower half of body whorl with low, but distinct, raised spiral cords beginning opposite the anal end of the aperture; irregular axial wrinkles on the body whorl

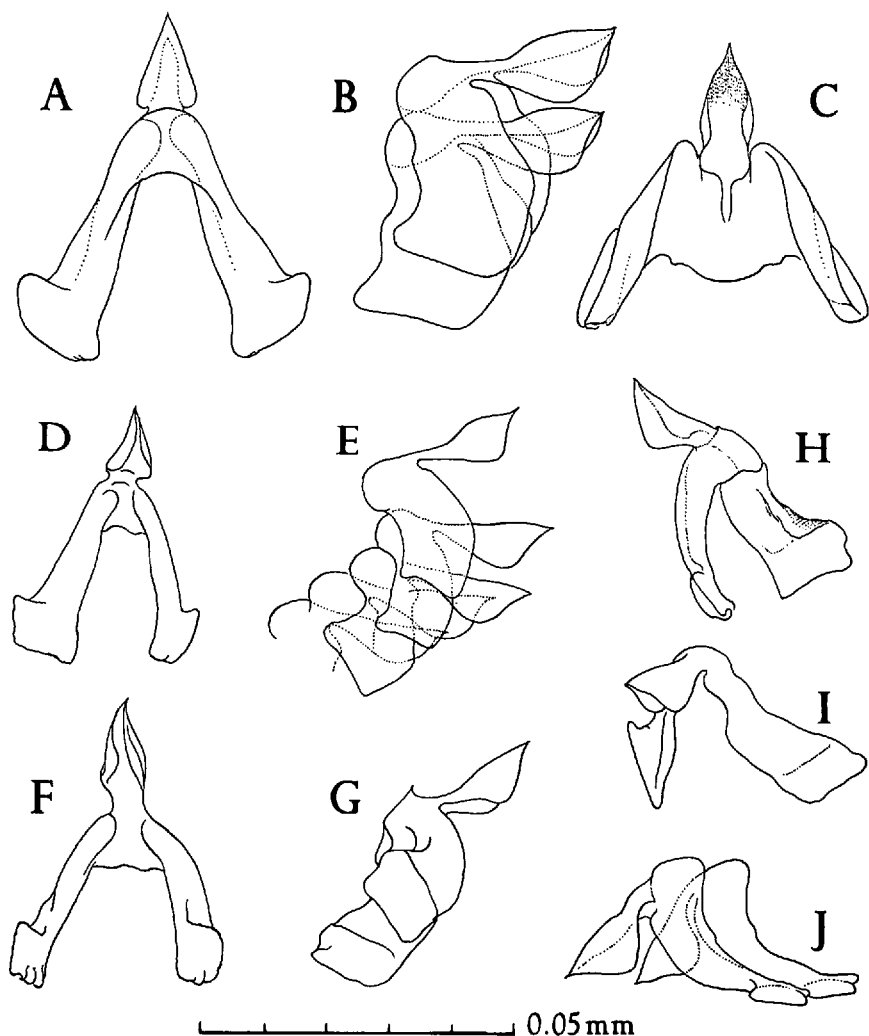


FIGURE 67. Radulae: A-C, *Volutomitra persephone*, n. sp.; D-J, *V. erebus*, n. sp.

(in addition to growth lines), especially approaching the outer lip, indicate successive pauses in growth.

No operculum. The radula is small, closely resembling that of *V. persephone*. The form of the rachidian (Fig. 67, D-J) is essentially identical, and the vestigial laterals appear as in that species.

Holotype.—USNM No. 701219, from PILLSBURY Sta. P-776.

Type-Locality.—Southern Caribbean Sea off Guajira Peninsula, Colombia (12°13.3'N, 72°50'W, 408-576 meters).

Remarks.—This species differs from *V. persephone* by its more persistent axial sculpturing, the spiral cords on the lower part of the body whorl, and the reduced fourth (anterior) columellar plication.

The material from stations P-478 and P-781 ranges in length from 19 mm to 21.5 mm, but cannot be distinguished conchologically from the larger holotype. These seem to be young individuals rather than a distinct taxon.

Class PELECYPODA

Family Dimyidae

Diagnosis.—Shell small, more or less iridescent, inequivalve, with the right valve attached, the left valve somewhat smaller and flatter; outer surface smooth or with weak radial sculpture and sometimes lamelliform concentrics; hinge margin straight, rather short, with weak outer and small inner ligament; outline rounded or ovate, often somewhat oblique; umbo scarcely projecting; mantle-line arcuate, anterior adductor muscle near the anterior margin, posterior larger, distinctly two-parted; mantle completely open, margin with papillae, without eyes; gills with uniform filaments without ascending limb; foot and labial palps rudimentary; sexes separate (Thiele, 1935: 804).

Remarks.—Moore (1970) has made some general comments about this family in his description of a new Caribbean genus and species. The Recent species now known from the western Atlantic are *Dimya argentea* Dall and *Dimyella starcki* Moore. Trawling operations aboard R/V PILLSBURY and R/V GERDA have obtained additional records of *D. argentea* and a new Caribbean species of *Dimya* possibly allied to *D. californiana* Berry from the Pacific coast of Mexico and Central America.

Deep diving by the late Dr. Thomas F. Goreau and his associates at Discovery Bay, Jamaica, and by Dr. Walter A. Starck in the Bahamas has brought to light another new dimyid quite distinct from the other Caribbean members of this family and agreeing in many respects with the genus *Dimyodon* 'Meunier-Chalmas' Fischer, a genus heretofore known as a fossil, but distinguished from it in details.

56. *Dimya argentea* Dall

Figs. 68; 71, B

Dimya argentea Dall, 1886, Bull. Mus. comp. Zool. Harv., 12(6): 228, pl. 4, figs. 5a, 5b (extensive discussion); 1889b, Bull. U. S. natn. Mus., 37:

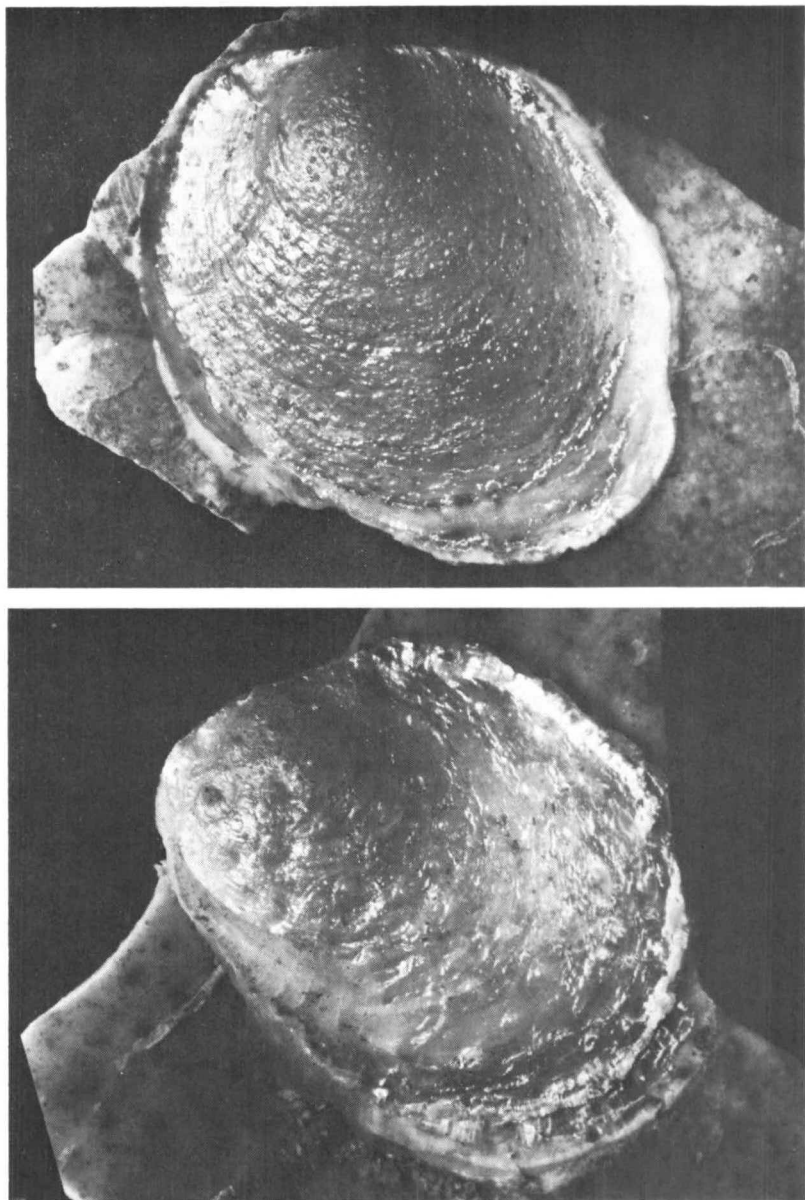


FIGURE 68. Dimyidae. *Dimya argentea* Dall, Sta. P-930: upper, height 16 mm, length 15.5 mm; lower, height 15.3 mm, length 14 mm (posterior edge slightly damaged).

32, pl. 4, figs. 5a, 5b (listed only; figure identical with foregoing); 1903 (reprint of 1889).—Thiele, 1935, *Handb. systematischen Weichtierkunde*, 2: 804 (listed only).—Moore, 1970, *J. Conch.*, Paris, 107(4): 140 (listed only).

This species has been described in detail by Dall (1886). The occurrences in our faunal explorations are now reported to amplify its geographical distribution. *Dimya argentea* appears to be rather common at moderate depths in the Straits of Florida and Caribbean Sea. In our collections, it was found attached to fragments of echinoid tests and to the peripheral expansion of *Tugurium* shells, just as reported by Dall. In some cases, specimens are attached to pieces of rock or slag, and in one instance to a glass bottle. Associated with *Dimya* are numerous Foraminifera, *Sarcodictyon* (octocorallia), *Stephanoscyphus* (Scyphozoa), Bryozoa, lepadomorph and verrucomorph barnacles, and *Rhabdopleura* (Pterobranchia).

Records.—Originally reported from off Cape Hatteras, St. Croix, St. Vincent, Grenadines, and Barbados. Taken by R/V GERDA and R/V PILLSBURY at the following stations: G-179 (27°41'N, 79°11'W, 549-567 m, 1 July 1963).—G-678 (25°57'N, 78°13'W, 540-576 m, 20 July 1965).—G-720 (26°22'N, 79°11'W, 476-500 m, 3 August 1965).—G-1012 (23°35'N, 79°33'W, 508-530 m, 14 June 1968).—G-1017 (23°58'N, 79°17'W, 555 m, 15 June 1968).—P-736 (10°57'N, 65°52'W, 69-155 m, 22 July 1968).—P-848 (11°22'N, 61°26.4'W, 146 m, 2 July 1969).—P-849 (11°14.5'N, 61°46.2'W, 137-143 m, 2 July 1969).—P-876 (13°13.9'N, 61°64.7'W, 231-258 m, 6 July 1969).—P-889 (14°04.4'N, 60°50.8'W, 371-403 m, 7 July 1969).—P-918 (16°04.1'N, 61°25.7'W, 399-497 m, 11 July 1969).—P-930 (15°29.7'N, 61°12'W, 210-399 m, 15 July 1969).—P-984 (18°26.4'N, 63°12.6'W, 393-451 m, 22 July 1969).

57. *Dimya tigrina*, new species

Figs. 69; 71, A

Description.—Shell attached by the right valve, obliquely ovate, broader posteriorly. The hinge line is not auriculate, rather long, about 0.5 of the length of the mantle cavity (defined by the extreme limits of the pallial impression), straight, flat, transversely grooved, narrower and faintly impressed beneath the umbo. The thin, linear external ligament is visible along the whole hinge line; a deep, ovate pit beneath the umbos, closer to the posterior than to the anterior, accommodates the internal ligament. Exterior of left valve dull, pale brown marked with narrow, irregular radial streaks of darker brown; umbonal and central area externally smooth, marginal area sculptured by low, irregular radial ribs and thin, slightly raised concentric growth lamellae, resulting in a delicately scaly or frilly surface showing only faint traces of nacreous iridescence; interior of left valve

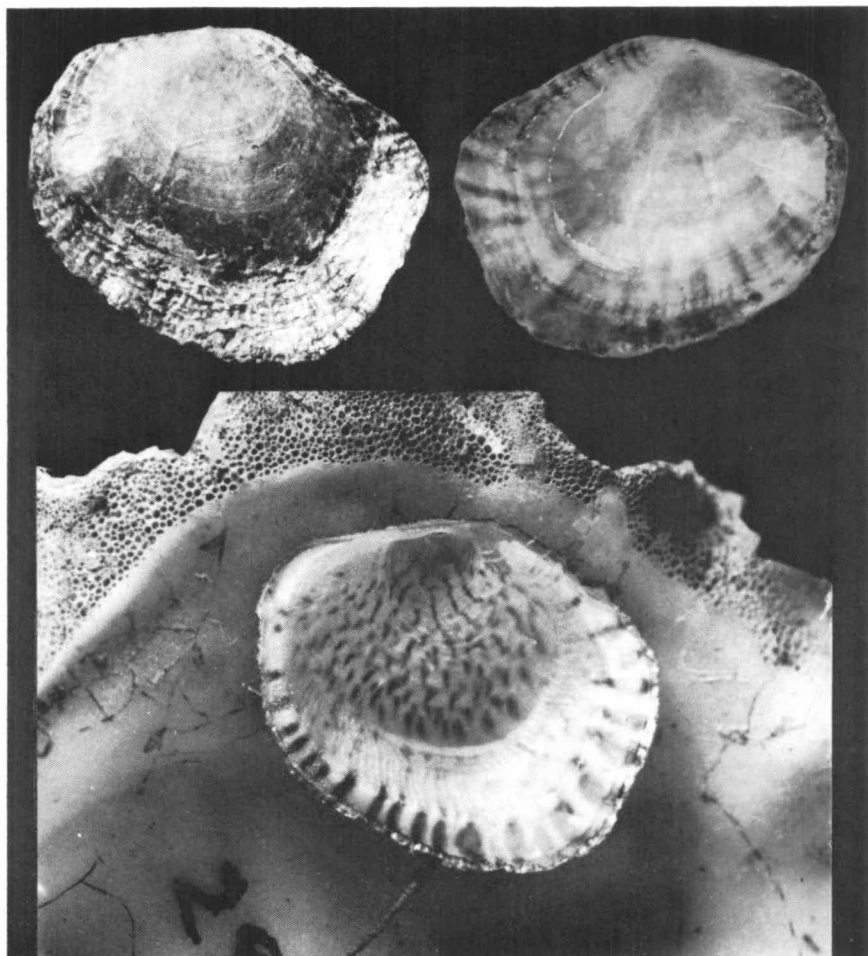


FIGURE 69. Dimyidae. *Dimya tigrina*, n. sp., holotype, Sta. P-392; height 7.85 mm (left valve) and 8.0 mm (right valve), length 9.4 mm (both valves).

porcellaneous, translucent, allowing the nacreous layer to show through marginally and showing distinct radial streaks of reddish brown; surface glossy marginally but within the pallial line dull except for the glossy muscular impressions.

Interior of attached valve cream white with conspicuous pattern of irregular radial streaks and spots of reddish brown most intense at the margins; surface marginally glossy, centrally dull except for the glossy muscular impressions; a wide band of irregular, narrow radial grooves and wrinkles

lies within the pallial line, narrowing toward the hinge where the wrinkles break up into granulations that merge with the cross-striated hinge line.

Anterior muscular impression elliptical, near the end of the hinge line and closer to the umbo than is the posterior impression. Posterior muscular impression well removed from the end of the hinge line, distinctly double, that in the left valve more clearly bilobed than that in the right.

The wide margin of the right valve is free of the substrate and flares broadly; its outer surface is marked with low, broad radials crossed by scaly concentrics, resulting in an imbricated appearance.

Measurements.—Left valve, length 9.4 mm, height at umbo, 7.85 mm; right valve, length 9.4 mm, height at umbo 8.0 mm (holotype).

Holotype.—USNM No. 701220, from PILLSBURY Sta. P-392.

Type-Locality.—PILLSBURY Sta. P-392, off Punta Piedras, Colombia: 9°45.1'N, 76°09.1'W, 79-75 meters; 16 July 1966.

Remarks.—This species is notable for its conspicuous color pattern of radial brown streaks and spots, and its minimal iridescence. The left valve is only slightly smaller than the right. *Dimya tigrina* seems to have a general resemblance to the eastern Pacific *Dimya californiana* Berry, in which the left valve is “irregularly clouded with Sayal brown,” and in which the area outside the pallial line is “beautifully silvery-pearly” (Berry, 1936: 126-127), but the type is in a private collection, and no authentic material has been available for comparison. *Dimya radiata* Kuroda, from Japanese waters, also is marked with radiating brown streaks.

Although Berry noted that the adductor impressions of *D. californiana* are proportionately larger than in other species, there are few reliable taxonomic characters whereby the species of *Dimya* can be distinguished. A thorough revision of the genus on a worldwide basis is needed to evaluate morphological characters of the shells and to place the taxonomy of these extremely interesting pelecypods on a firm basis.

Basiliomya, new genus

Diagnosis.—Shell subcircular in outline, translucent, with negligible iridescence; left valve smooth externally, but sometimes reproducing irregularities of the substrate; radial sculpture on outer surface of free margin of right valve; edge of right valve more or less widely extended as a thin, lobate marginal frill. Hinge of right valve with a blunt, triangular tooth on each side of the internal ligament and a shallow socket at each end of the hinge line; left valve with a shallow groove on each side of the internal ligament and a blunt tooth at each end of the hinge line; a series of interlocking small teeth and pits around the perimeter of both valves. Anterior adductor

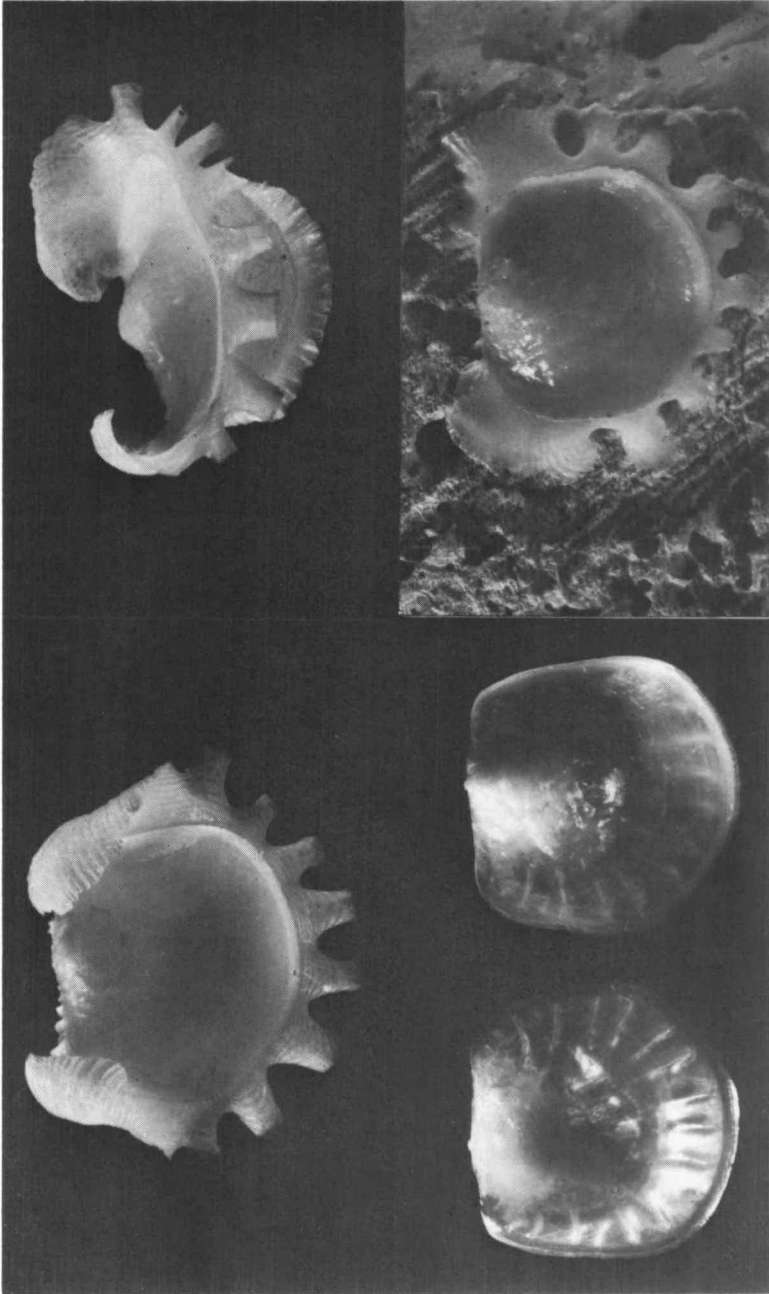


FIGURE 70. Dimyidae. *Basiliomya goreau*, n. sp., from Discovery Bay, Jamaica. Upper, lateral and oblique views of holotype; lower (left to right), inner and outer views of left valve of holotype; paratype, complete specimen in situ.

near end of hinge line; posterior adductor remote from hinge, conspicuously bilobed; pallial impression marked by a row of shallow pits.

Type-Species.—*Basiliomya goreau*, new species, here designated.

Gender.—Feminine.

Remarks.—This distinctive genus resembles the fossil *Dimyodon* Meunier Chalmas (*in* Fischer, 1886: 937) in the characters of the hinge, but has an additional tooth at each end of the hinge line in the left valve and corresponding sockets in the right. It differs further in having the posterior adductor impression distinctly bilobed as in *Dimya*, whereas it is simple in *Dimyodon* as illustrated by Fischer (1886).

58. ***Basiliomya goreau***, new species

Figs. 70; 71, C-E

Description.—Shell subcircular, attached by the right valve, translucent porcellaneous white with faint pearly reflections internally, especially in the left valve. The right valve has a more or less strongly up-turned ventral margin rising vertically from the substrate, hence the valve is deep, whereas the left valve is almost flat, with only a weak concavity within the pallial line. Externally, the left valve is unsculptured (although it may show irregularities due to the surface of the substrate), convex in the umbonal area and concave marginally, recessed within the right valve and fitting it tightly. Margin of the right valve expanded beyond the edge of the left valve to form a thin flange with several blunt marginal digitations; ventrally this flange is bent toward the substrate so the marginal digitations are directed downward, but anteriorly and posteriorly it extends as two broad, fluted lobes that may be either spread outward and downward, or reflected upward and curled over the ends of the free valve. The ventral junction of the right valve with the substrate is strengthened by a fluted, buttresslike structure that evidently was the first marginal expansion formed when the shell reached its definitive diameter; subsequent shell-growth proceeds vertically with respect to the substrate, and although a series of marginal flanges may be formed (Fig. 71, E), most of the specimens observed have only one. The width and elegance of the frill varies, presumably according to local conditions, but it is present in all specimens examined from Jamaica and the Bahamas.

The hinge line is straight, not auriculate, about 0.42 of the length of the upper valve; in the lower (right) valve, the ligament is flanked on both sides by a low, bluntly triangular tooth, and there is a shallow, rounded pit at each end of the hinge line. The dorsal aspect of the two teeth is transversely striated where it articulates with triangular depressions, correspondingly striated, on either side of the ligament in the upper valve. In the upper valve, a low, bluntly rounded tooth stands at each end of the hinge

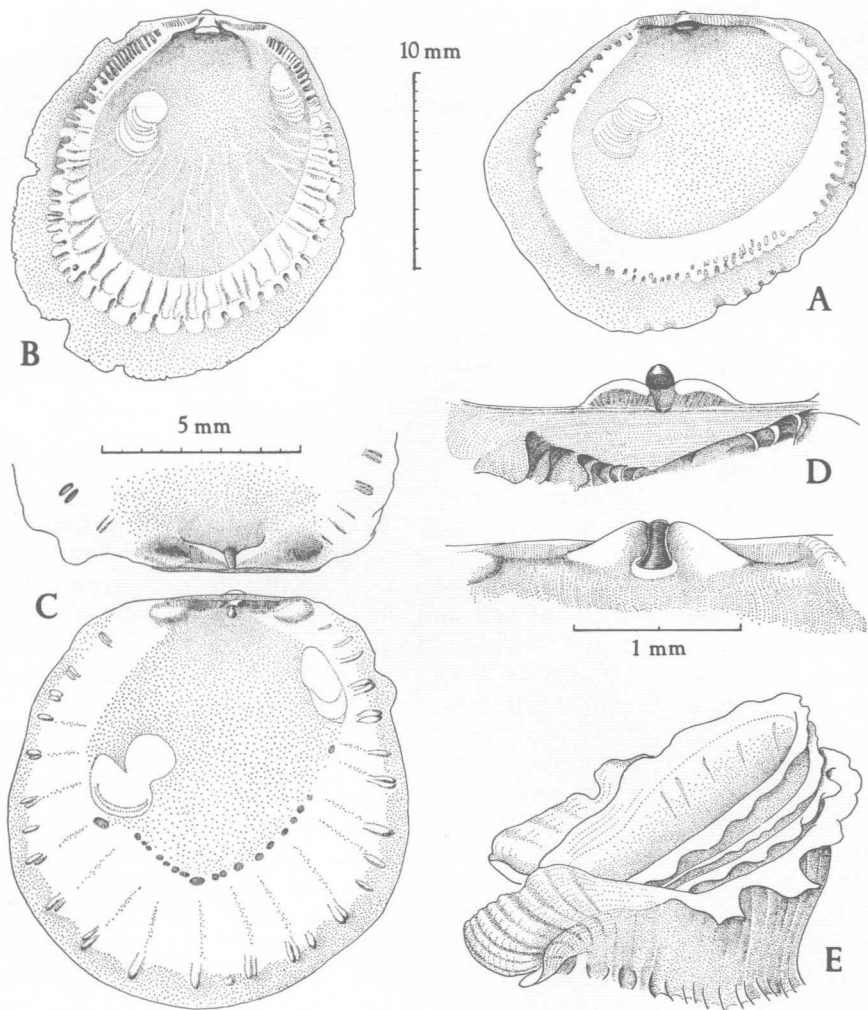


FIGURE 71. Dimyidae. A, *Dimya tigrina*, n. sp., holotype; interior of left valve; B, *D. argentea* Dall, Sta. P-876; C, *Basiliomya goreauui*, n. sp., paratype; interior of left valve and umbonal area of right, showing general features of hinge; D, *Basiliomya goreauui*, n. sp., paratype; hinge of right valve, dorsal and ventral aspects; E, *Basiliomya goreauui*, n. sp., paratype; oblique view of right valve. (The 10-mm scale applies to A and B; 5-mm scale to C and E; 1-mm scale to D.)

line and articulates with the sockets in the lower valve. No external ligament can be seen and, if present, must be extremely delicate. The internal ligament is attached in the umbonal depression of the right valve and in a subumbonal pit in the left valve.

Within the margin of the left valve there is a series of radially oriented, elongated denticles, sometimes simple, sometimes paired, which fit within correspondingly simple or paired pits in the opposite valve (Fig. 71, C). Interior of both valves glossy, but roughened within the pallial impression of the left valve; inner boundary of pallial impression marked by a series of conspicuous round or ovate shallow pits; in the right valve the upward curvature of the shell begins at the pallial impression and the pits are difficult to observe. Anterior muscular impression elliptical, removed by less than its own length from the end of the hinge line. Posterior muscular impression large, bilobed, situated about midway between dorsal and ventral margins.

Measurements.—Length of left valve, 4.7 mm, height 4.8 mm; length (including marginal frill) of right valve, 7.1 mm, height 5.9 mm (holotype). Length of left valve 4.5 mm, height 4.4 mm; length of right valve (posterior frill damaged) 7.0 mm, height 5.7 mm (illustrated paratype, Fig. 70).

Holotype.—USNM No. 701221; Discovery Bay, Jamaica, depth 170 feet; attached to dead branch of scleractinian coral (*Madracis*). Collected by Dr. Thomas F. Goreau, December 25, 1964.

Paratypes.—Discovery Bay, Jamaica, West Bull, depth 200 feet; attached to lower surface of scleractinian coral (*Agaricia*). Five right valves, collected by J. B. C. Jackson, 1970.

Discovery Bay, Jamaica, 175 feet; attached to lower surface of scleractinian coral (*Agaricia*). Five complete specimens and two right valves, collected by J. B. C. Jackson, October 1970.

Reef off Goat Bay, Fresh Creek, Andros I., Bahamas, 75-100 feet; attached to bottom of large coral (*Agaricia*). Complete specimens and empty right valves, collected by J. D. Starck and Peter Hopper, 19 December 1969.

Andros Island, Bahamas; attached to scleractinian coral (*Scolymia*). One complete specimen and one right valve, collected by W. A. Starck and J. D. Starck, April 20, 1970.

Family Spondylidae

59. *Spondylus gussoni* Costa

Fig. 72

Spondylus gussoni O. G. Costa, 1829, Cat. Sist.: xlii.—Philippi, 1836, Enum. Moll. Siciliae, 1: 87, pl. 5, fig. 16.—Dall, 1886, Bull. Mus. comp. Zool. Harv., 12: 227.—Locard, 1898, Expéd. Travailleuse & Talisman, 4(2): 420, pl. 18, figs. 1-8.

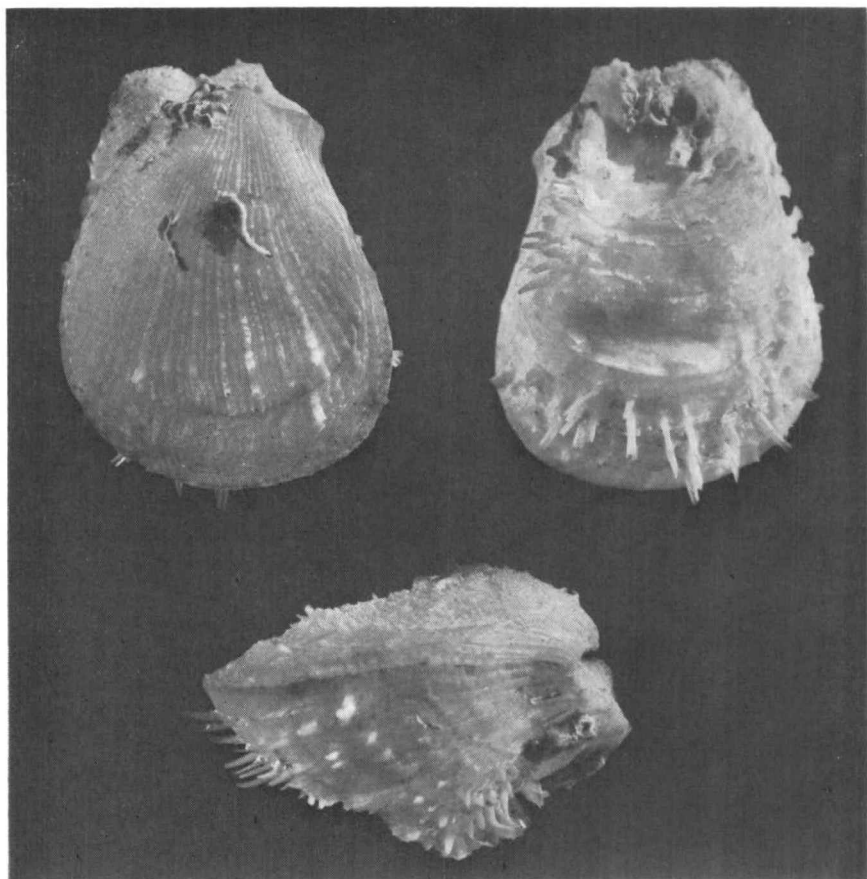


FIGURE 72. Spondylidae. *Spondylus gussoni* O. G. Costa, Sta. P-887.

Not *Spondylus gussoni*, Webb, 1935, Handbook: 54 (= *S. regius* L.).—Barrett & Patterson, 1970, Shells and Shelling: 54, fig. 1 (= *S. ictericus* Rve.)

Records.—PILLSBURY Sta. P-887, off St. Lucia, 14°10.6'N, 60°55.8'W, 73-110 m, 7 July 1969; one living specimen.—P-1303, Caribbean Sea, 20 miles ESE of Sto. Domingo, island of Hispaniola, 18°21.0'N, 69°14.3'W, depth 174 m, 21 July 1970. Single attached valve.

Remarks.—Taken by the BLAKE off Nevis, Barbados, Grenada, and Yucatan, at depths from 168 to 686 meters. Dall stated, "The specimens have been compared with authentic European examples, and agree precisely." Compared with the PILLSBURY specimens, those from 207 fm (= 379 m)

off Morocco in the U. S. National Museum of Natural History (196472, Jeffreys Coll.) are similar in size and shape but thicker in construction, with about 50 equal ribs without spines (wear?). The specimen collected by the TRAVAILLEUR in the Bay of Biscay (USNM 62240, Jeffreys Coll.) has the anterior auricle of the left valve more prominent, ribs equal but more numerous (about 75), with close-set sharp, short, decurved thorns. Although nothing is known of the variation in true *S. gussoni*, it seems possible that eastern Atlantic material pertains to more than one species and quite probable that western Atlantic material is specifically distinct.

The name *S. gussoni* has been attached to the common shallow-water *S. ictericus* in some popular literature and not infrequently is applied in that sense to specimens by collectors. There is clearly no basis for this usage.

SUMARIO

MOLUSCOS NUEVOS Y RAROS COLECTADOS POR LOS BARCOS DE INVESTIGACIONES JOHN ELLIOTT PILLSBURY Y GERDA EN EL ATLÁNTICO OCCIDENTAL TROPICAL

Se reportan e ilustran 59 especies nuevas o raras de moluscos marinos, 55 gasterópodos y cuatro pelecípodos, del área del Caribe. Entre éstos se describen las siguientes nuevas taxa: *Calliostoma olssoni*, n. sp., *Thelyssa callisto*, n. gen., n. sp., *Lischkeia deichmannae*, n. sp. (Trochidae); *Sconsia nephele*, n. sp. (Cassidae); *Typhis* (*Siphonochelus*) *tityrus*, n. sp. (Muricidae); *Columbarium* (*Peristarium*) *electra*, n. subgen., n. sp., *C. (P.) merope*, n. sp., *C. (P.) aurora*, n. sp. (Columbariidae); *Coralliophila fax*, n. sp., *C. sentix*, n. sp. (Coralliophilidae); *Teramachia chaunax*, n. sp. (Turbinellidae); *Lyria* (*Cordilyria*) *cordis*, n. subgen., n. sp., *Scaphella* (*Clenchina*) *evelina*, n. sp., *Volutomitra persephone*, n. sp., *V. erebus*, n. sp. (Volutidae); *Dimya tigrina*, n. sp., *Basiliomya goreau*, n. gen., n. sp. (Dimyidae). Se da el primer reporte de ejemplares vivos de *Bathygalea coronadoi* (Crosse). *Mesorhytis meekiana* Dall, originalmente asignada a la familia Fasciolariidae, es transferida al género *Teramachia* y colocada en la familia Turbinellidae. Las conchas son ilustradas por medio de fotografías, las rádulas y los opérculos de algunas de las especies son ilustradas con dibujos y el conjunto de la anatomía de la cavidad del manto es ilustrada en *Oocorys sulcata* Fischer, *Vasum capitellum* (Linné) y *Lyria cordis*, n. sp.

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